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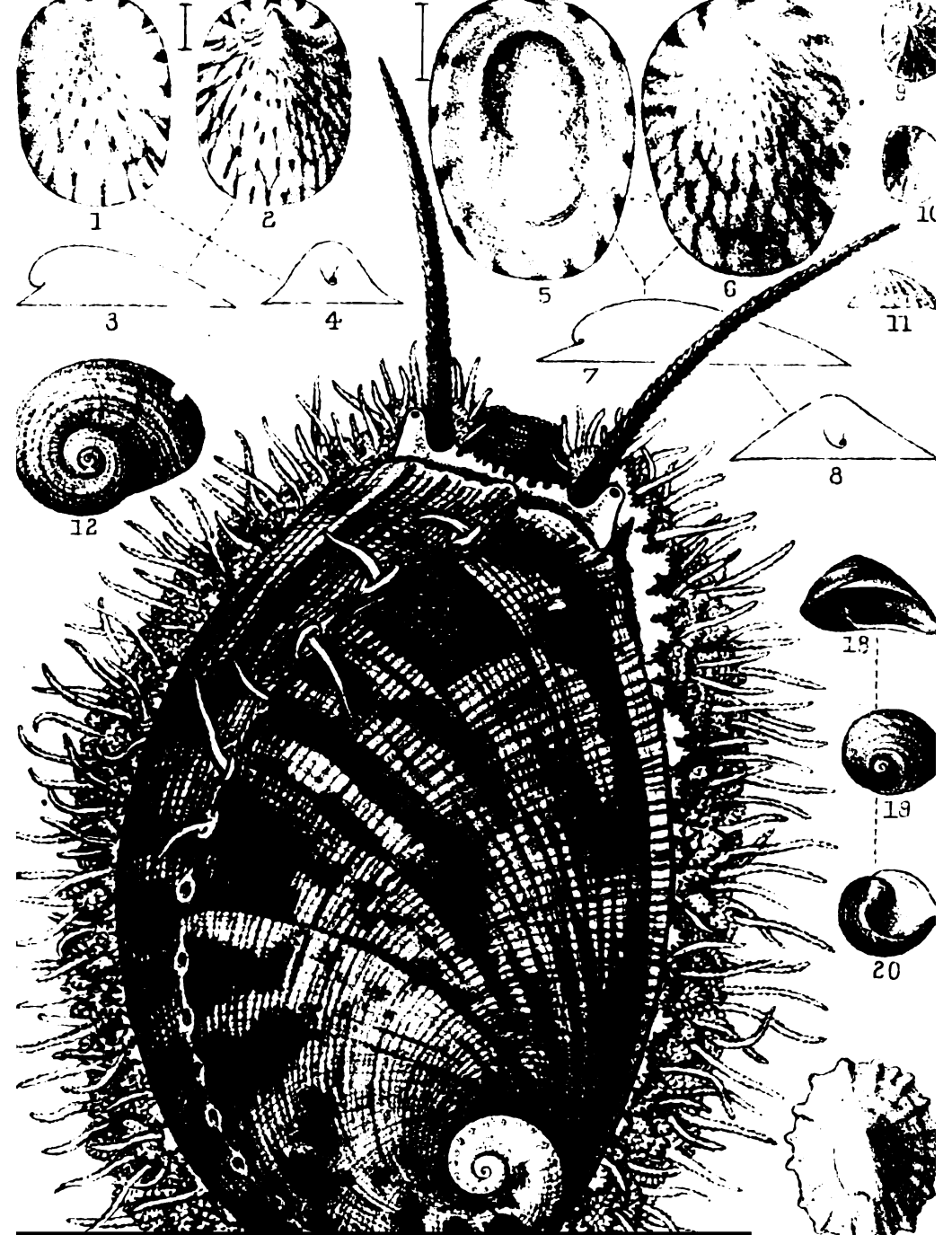

Manual of conchology, structural and systematic

George Washington Tryon, Henry Augustus Pilsbry, B. Sharp

N-T

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ornamented with concentric brown rings, cancellated with elevated and concentric lines; pale around the foramen; posterior extremity much elevated; foramen large, cusp-shaped, dilated posteriorly.

Cagayan, Philippine Is.

M. cuspidata AD. P. Z. S. 1850, p. 202.—SOWB. Thes., p. 106, f. 226.

M. PRODUCTA A. Adams. Pl. 59, fig. 62.

Shell narrowly oblong, back elevated, convex, white, variegated with pale brown; obsoletely decussated with elevated lines and concentric striæ; anteriorly narrow, produced, sides planulate, posterior extremity rounded, elevated: margin deeply sinuated; foramen very long, triangular, posteriorly dilated. (*Ad.*)

Port Lincoln, S. Australia, deep water.

M. producta AD. P. Z. S. 1850, p. 202.—SOWB., Thes., p. 205, f. 224.—ANGAS, Moll. Fauna S. Austr., in P. Z. S. 1865, p. 185.

M. ANGUSTATA A. Adams. Pl. 59, figs. 61.

Shell narrow, oblong, back elevated, rounded, white, painted and tessellated with brown lines and reddish-brown spots; sculptured with obtuse, subrugose riblets and depressed, subdistant concentric lines; posterior extremity elevated, margin sinuated; foramen large, elongated, subtriangular, posteriorly dilated, excavated. (*Ad.*)

Habitat unknown.

M. angustata AD. P. Z. S. 1850, p. 203.—SOWB. Thes., p. 205, f. 225.

M. BAKIEI (A. Adams) Sowb. Pl. 59, fig. 65.

Shell oblong, subquadrate; anterior margin elevated, reflexed, sides anteriorly depressed; posterior margin depressed, subtruncate; having rounded, subnodulous ribs, alternately larger in front; white, ornamented with radiating bands varied with brown lines at the sides and between the ribs of the posterior portion. Foramen at the posterior margin. (*Sowb.*)

Habitat unknown.

M. Bakiei A. AD., (where?) SOWB. Thes. Conch., iii, p. 206, f. 221.

M. NOVÆCALEDONIÆ Sowerby Jr. Pl. 59, fig. 55.

Shell oval, grayish-red, minutely punctate, radiated with minute riblets larger posteriorly; anterior margin elevated, posterior margin subdepressed, scarcely acuminate; foramen rather short, situated

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at the anterior margin. A more regularly oval species than the preceding [*M. tasmaniæ*], and of a speckled reddish color. (*Sowb.*)

New Caledonia.

M. novæ-Caledoniæ SOWB. Thes. Conch., iii, p. 206, f. 222.

The absurdity of mistaking the head for the tail, in Sowerby's de-description, translated above, I will leave the reader to correct for himself.

M. SCUTIFORMIS Nevill. Pl. 6 ł, fig. 20.

Shell ovate-elongate, laterally a little compressed and slightly insinuated; moderately elevated, a little solid, ornamented with radiating and minute concentric striæ; dull white, marked with a few radiating brown bands; foramen long, excentric, occupying nearly a third part of the entire length, narrowed behind; margin of the aperture a little obtuse, simple; margin of the foramen thickened within. Length 12¾, width 6½, alt. 2 mill. (*Nevill.*)

S. province Ceylon.

M. scutiformis G. & H. NEVILL, Journ. Asiat. Soc. Bengal, xxxviii, p. 163, t. 17, f. 14.

Genus LUCAPINELLA Pilsbry, 1890.

Lucapinella PILSBRY, Manual of Conchology, pt. 47, p. 179. Issued December 16, 1890.—*Clypidella* and *Fissurella*, in part, of authors.

Fissurellidæ with an oblong shell, not sunken in or covered by the mantle, and about as long as the foot; its apex subcentral, wholly removed by a rather large oblong perforation, which is margined within by an entire (not truncated) callus; edge of shell blunt, scarcely crenulated in adults except in front and behind; sculptured with scaly riblets; front and side-margins level, posterior margin a little elevated. Animal with a fleshy foot, much too large to be contained in the shell; mantle-edge thickened, papillose on its lower edge and having narrow processes extending up over the shell-edge; tentacles short, obtuse; foot surrounded by a row of epipodial papillæ; dorsal pore surrounded by papillar processes.

The genus defined above differs from *Fissurella s. s.* and *Clypidella* in the much larger, fleshier foot; from *Fissurellidea*, *Megatebennus*, *Pupillæa* and *Lucapina* in not having the shell at all imbedded in the mantle; and finally from *Macroschisma* by the subcentral fissure, short tentacles and possession of an epipodial row of

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MANUAL

OF

CONCHOLOGY;

STRUCTURAL AND SYSTEMATIC.

WITH ILLUSTRATIONS OF THE SPECIES.

BY GEORGE W. TRYON, JR.
CONTINUATION BY
H. A. PILSBRY,
CONSERVATOR OF THE CONCHOLOGICAL SECTION OF THE ACADEMY OF NATURAL SCIENCES OF PHILADELPHIA.

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Vol. XII.

STOMATELLIDÆ, SCISSURELLIDÆ, PLEUROTOMARIIDÆ, HALIOTIDÆ, SCUTELLINIDÆ, ADDISONIIDÆ, COCCULINIIDÆ, FISSURELLIDÆ.

PHILADELPHIA:
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The present volume is devoted to those families of the suborder Rhipidoglossa which have not already been included in the MANUAL. The sequence in which the families of this group have been monographed, is, owing to causes not controlable by the writer, not entirely natural; a better arrangement is given in the appendix.

The terms used in descriptions are the same as in the previous volume: *spiral* indicating a direction parallel to the volutions, *longitudinal* meaning parallel to the axis of the shell. The writer is aware that some authors have given these terms a different signification; making *longitudinal* a synonym of *spiral*, and substituting *transverse* for sculpture parallel to the shell-axis; But the word *transverse* has also been used by A. Adams and others, in a sense synonymous with *spiral*. The words *longitudinal* and *transverse* have thus come to mean "all things to all men." Disclaiming any intention or desire to criticize the usage of other malacologists, the writer has adopted the nomenclature preferred by a majority of English and continental authors; merely noting in this place the diametrically opposed senses in which authors have employed these descriptive terms. H. A. P.

Philadelphia, April, 1890.

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MANUAL OF CONCHOLOGY.

MONOGRAPHS OF THE FAMILIES STOMATELLIDÆ, SCISSURELLIDÆ, HALIOTIDÆ, Etc.

Family STOMATELLIDÆ A. Adams, 1850.

Stomatiidæ of Fischer and others, is synonymous.

Shell either spiral, subglobose, depressed, or haliotis-shaped, or non-spiral and limpet-like; imperforate; aperture very large, pearly inside; muscle-impression crescentic, open in front.

Animal with a broad foot, longitudinally divided by a median line below, and tuberculate above. Muzzle broad, ending distally in an oval disc, the mouth rounded; tentacles long, pointed; eyes on short heavy peduncles outside and behind the tentacles; epipodium prominent, fleshy, with or without cirri; frontal lobes present; mantle-edge simple or reflexed and foliated; not slit in front. Operculum small, horny, thin, multispiral, often wanting. Gill a single curved plume on the left or outer side of the mantle cavity, its distal third free. Verge wanting. Formula of teeth (00.1) 5. 1. 5 (1.00).

A family of small, brilliantly nacreous shells closely allied to Trochidæ but with fewer whorls, and larger aperture. There have been considerable differences observed between the animals of various genera of *Stomatellidæ;* under *Stomatella* I have described the animal examined by myself.

These shells tell very clearly the story of the origin of limpet-like types in the Rhipidoglossa. From *Stomatella* we can trace by a chain of closely allied forms, the uncoiling of the spire and increase of the body-whorl to *Stomatia, Gena,* and finally *Broderipia,* where some species have the form of typical Patella.

The monographic works on *Stomatellidæ* are as follows:

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An arrangement of Stomatellidæ, including the characters of a new genus and of several new species. By Arthur Adams, R. N., F. L. S., etc. This paper was published in Proc. Zool. Soc. Lond. 1850, and Annals and Magazine of Nat. Hist. vii, 1851.

Monograph of Stomatellinæ, a subfamily of Trochidæ. By A. Adams, in Sowerby's Thesaurus Conchyliorum, vol. ii (1855).

Monographs of Stomatella, Stomatia, Gena and Broderipia, by G. B. Sowerby Jr., in Reeve's Conchologia Iconica, vol. xix, April, 1874.

Synopsis of Genera.

Genus STOMATELLA Lamarck, 1819.

Shell imperforate, spiral, orbicularly depressed; spire elevated but short, conic; whorls rounded not plicate below sutures, the last forming the greater part of the shell; surface spirally ribbed, variegated; aperture large, wider than long, pearly inside; operculum circular, multispiral, horny. Type, *S. imbricata* Lam.

Subgenus SYNAPTOCOCHLEA Pilsbry, 1890.

Shell oval, intermediate between Stomatella and Gena in contour; spire very short, sub-marginal; surface spirally striated or decussated; aperture very large, longer than wide. Operculate. Type, *S. montrouzieri* Pilsbry.

Subgenus NIPHONIA A. Adams, 1860.

Shell depressed-globose, thin, imperforate; whorls rapidly increasing; aperture large, circular; peristome duplicated, outer margin thin, acute, ascending on the last whorl, inner margin thickened, continuous with outer lip. (*Ad.*) Type, *N. pulchella* Ad.

Genus PHANETA H. Adams, 1870.

Shell imperforate, trochiform; spire of few whorls, the last carinated, expanded; base depressed; aperture ample, rounded, anteriorly subsinuated, pearly inside; columella revolute, acute; peristome simple, straight. (*Ad.*) Type, *P. everetti* Ad.

Borneo.

A fluviatile mollusk.

Genus STOMATIA (Helbling) Lamarck, 1801.

Shell spiral, oblong or depressed orbicular; spire prominent but short; surface tubercled or keeled; whorls with a series of short

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folds below the suture; aperture either oblong or transversely oval, and longer than wide or the reverse; pearly inside. No operculum. Type, *S. phymotis* Helbling.

East Indies.

Subgenus MICROTIS H. & A. Adams, 1850.

Shell spiral, suborbicular, depressed, with two tuberculated ridges; spire slightly projecting; aperture very large, wider than long, pearly within; columellar margin spiral, visible as far as the apex of the spire. Operculum none. (*Ad.*) Type, *M. tuberculata Ad.*

Philippines; New Caledonia; Paumotus.

Genus GENA Gray, 1850.

Shell subspiral, Haliotis-shaped, oblong; spire minute, sub-lateral surface smooth or striated; aperture very large, nearly as long as the shell, pearly within. Operculum none. Type, *G. planulata* Lam.

Indian Ocean to Central Pacific.

Subgenus PLOCAMOTIS Fischer, 1885.

Shell polished, the body-whorl not striated as it is in typical *Gena*, and the animal with epipodial cirri. Type, *G. lævis* Pease.

Genus BRODERIPIA Gray, 1847.

Shell oval, limpet-shaped, bilaterally symmetrical when adult, the apex either subcentral or posterior, and either remaining as a minute recumbent spiral or lost in the adult shell. Interior brilliantly iridescent or almost deprived of nacre. Type, *B. rosea* Brod.

S. Pacific and Indian Oceans.

Genus STOMATELLA Lamarck, 1819.

Stomatella LAM. (Philos. Zool., 1809, mentioned but not described, and no species cited) Anim. s. Vert. vol. vi, p. 209, 1819. First species, *S. imbricata* Lam.

The smaller foot, provided with an operculum separates this genus from *Stomatia* and *Gena*. Several species referred to *Euchelus* have a great likeness to the shells of this genus, partaking of the form and sculpture to a remarkable extent. *E. cancellatus* Krauss is an example of this. That species is however umbilicated, and seems to belong rather to the *Trochidæ* than to *Stomatella*. An examination

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of the anatomy only can definitely settle this point. There seems to be an almost perfect transition in some species of *Stomatia* to this genus; in these again, we await a knowledge of the animal to definitely group them. There is also a certain analogy between some *Stomatellæ*, such as *S. coccinea*, and the species of *Gena* having carinated upper whorls, *G. rosea* for example. The transition to *Stomatia* seems to be formed by *S. notata* Ad. and other forms of that group.

The writer has given the results of an examination of an alcoholic specimen of the animal of *Stomatella Godeffroyi* Dkr. (=S. mariei Crosse, var.) in Proc. Acad. N. S. Phila., 1890. Part of the figures are reproduced on pl. 22, figs. 30–33. The foot is broad and fleshy, deeply divided by a median longitudinal groove and transversely wrinkled, emarginate posteriorly. Its upper surface is granulate and tuberculate. The muzzle is rather broad, transversely wrinkled, ending in a flat, oval disc, the mouth about in the center; tentacles stout but tapering; eyes on peduncles outside and a little above the bases of the tentacles; these peduncles are short and stout. The epipodial ridge commences on a short triangular lobe behind the right eye-peduncle; the edges of this lobe are somewhat upturned, like a short trough. Along the sides of the foot the ridge is prominent, fleshy; and bears two short slender cirri; it terminates posteriorly at the operculigerous lobe. On the specimen before me there is no operculum, and the hind margin of the foot is upturned partly over the lobe, probably from contraction in alcohol. There are two minute frontal lobes between the tentacles, not connected across the muzzle. No external male organ was observed. The gill is single, composed of numerous (about 130) narrow plates, arranged in one series, its anterior third free. The anus opens at the summit of a short peduncle.

The radula bears a general resemblance to that of some *Trochidæ*. The rhachidian tooth has a broad expanded base, narrowed, reflexed and denticulated at apex; the laterals (5 on each) are quite complicated in form (see Proc. Acad. Nat. Sci. Phila., 1890); their cusps are well reflexed and denticulate. The inner uncinus has a very broadly expanded, triangular body and narrow cusp; the following uncini are narrow, not notably different from the usual conformation in Rhipidoglossa. The outer uncini have very long, serrate cusps. The figures on pl. 22 are considerably enlarged. A specimen collect-

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ed by the Godeffroy expedition years ago, No. 60696 of the Academy register, furnished these notes.

The species may be grouped by shell-characters into three or four sections, as follows:

Group of *S. imbricata* Lam. Shell depressed; aperture excessively oblique; sculpture consisting of close, equal spiral cords.

Group of *S. sulcifera* Lam. Shell globose depressed; aperture less oblique; surface nearly smooth, or with alternately larger and smaller spiral riblets, the interstices obliquely latticed by lines of increment.

Group of *S. mariei* Crosse. Shell depressed, rather flattened above and below; aperture quite oblique; sculpture consisting of numerous spirals, of which several are low carinæ, more numerous intermediate riblets, and still more numerous interstitial spiral striæ; sometimes decussated by growth-lines.

Group of *S. coccinea* Ad. Small species, resembling the last group somewhat.

The first three groups are East Indian in distribution, the last one is West Indian.

NOTE:—The diagram on pl. 51, figs. 4, 5, illustrates the method of measurement adopted for the species of *Stomatella*. The vertical line *d. e.*, is the altitude; the line *f.*, *c.* the diameter; the radii are measured from *a.* to *b.* and from *b.* to *c.*

A. Oriental species.

(*Group of S. imbricata Lam.*)

S. IMBRICATA Lamarck. Pl. 55, fig. 62; pl. 51, figs. 4, 5.

Shell very much depressed, solid, white with scattered dots of reddish; surface covered with very numerous, close, equal spiral riblets, separated by deep interstices, and closely finely scaly. Spire low, short; whorls 4, widening with extreme rapidity. Aperture subhorizontal, transverse-oval, lined with a closely sulcate silvery and iridescent nacre; columella broad, flattened, a little concave, its edge arched and thin.

Alt. 18, diam. maj. 34 mill.; aperture, breadth 24, oblique alt. 24 mill.

Port Adelaide, Port Jackson and Torres Sts., Australia; Java.

Stomatella imbricata LAM., Anim. s. Vert. vi, p. 209.—DESHAYES Encycl. Méth. iii, p. 984, t. 450, f. 2.—A. AD. in Sowerby Thes. Conch. ii, p. 833, t. 174, f. 1.—ANGAS, P. Z. S. 1867, p. 218.—WAT-

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SON, Challenger Rept., p. 111.—*Stomatia imbricata* SOWB., Genera ii, t. 143, f. 1.—*S. imbricata* Lam. BRAZIER, Proc. Linn. Soc. N. S. W. ii, p. 46.

One of the largest species. The very depressed form, nearly horizontal aperture and closely, evenly spiralled surface distinguish it.

(*Group of S. sulcifera Lam.*)

S. PAPYRACEA Chemnitz. Pl. 52, figs. 46, 47; pl. 51, fig. 9.

Shell globose, thin, obliquely conoidal, fawn colored, with a series of short markings at the periphery alternately reddish and white, and narrow girdles on the spirals of fine arrow-shaped articulations. Surface shining, polished, spirally sculptured by numerous low wide riblets ; striæ of increment fine. The spire is conical, small, acute; whorls 5 to 6, the last very rapidly enlarging, those of the spire with narrow sharp spiral liræ decussated by close raised longitudinal striæ. Aperture oval, acutely angular above, not very oblique, brilliantly iridescent inside, and lightly sulcate; columella deeply arcuate, umbilical region covered by an opaque, white, arcuately striated callus, its outer edge well defined.

Alt. 25, diam. 28 mill.; aperture, breadth 18, oblique alt. 20 mill.

Sooloo Archipelago (A. Ad.); *Moluccas* (Gould).

Cochlea lunaris papyracea fragilissima, etc., CHEMNITZ, Conchyl. Cab. v, p. 215, t. 182, f. 1817, 1818 (1781).—*Stomatella papyracea* Chemn., A. AD. in Thes. Conch. ii, p. 836, t. 174, f. 4, 5.—SOWERBY in Reeve's Conch. Icon. xix, f. 3.—*Stomatella tumida* GOULD, Proc. Bost. Soc. N. H. iii, p. 74, 1849; U. S. Expl. Exped. Moll., p. 209, f. 249.

The animal, according to Adams, has a horny operculum and although bulky is able to retract entirely within the shell.

The shell is smoother, more polished than any other large species; the umbilical callus is also notable.

The *S. tumida* of Gould is figured on pl. 51, fig. 9.

S. BACONI A. Adams. Pl. 52, figs. 38, 39.

Shell oval-orbicular, subturbinate; spire produced, apex acute; whorls concave above; dull white, variegated with reddish-brown, transversely spirally sulcate, the interstices longitudinally striated; aperture sulcate within; inner lip a little thickened, white, reflexed,

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concentrically striate. Smaller than *S. papyracea*, more solid, and more sharply sculptured.

Swan River (Mus. Cuming).

S. baconi A. AD., P. Z. S. 1853, p. 73; in Sowb., Thes. Conch. ii, p. 838, t. 174, f. 25, 26.—SOWERBY in Conch. Icon., f. 16.

This seems to me a variety of the *papyracea*. The whorls are clouded with rufous, and the liræ are minutely articulated. The sculpture, especially the longitudinal striæ, are decidedly stronger and sharper than in S. papyracea.

S. SULCIFERA Lamarck. Pl. 52, fig. 59.

Shell orbicular, rather thin, the spire short, conoidal, grayish or pinkish, with narrow reddish-brown irregular longitudinal stripes, often broken into dots on the spirals. Sculpture of narrow spiral riblets with interstitial smaller threads, the interstices finely latticed by raised close longitudinal striæ. Whorls about 4, the last 1½ very rapidly widening, descending anteriorly. Aperture large, oblique, oval, lightly sulcate within and brilliantly iridescent, with red, sky-blue and green reflections, neither predominating. Columella arcuate, thin, with a new-moon shaped flat white or slightly iridescent tract bounding it.

Alt. 19, diam. 22 mill.; aperture, breadth 15½, oblique alt. 19 mill.; greater radius 17, lesser 6.

Philippines.

S. sulcifera LAM., An. s. Vert., p. 210.—DELESSERT, Rec. de Coq., t. 33, f. 3.—ADAMS, in P. Z. S. 1850, p. 30; in Thes. Conch. ii, p. 833, t. 174, f. 3.—SOWERBY in Conch. Icon., f. 11.

This is a less globose shell than *S. papyracea* or *baconi*, with more oblique aperture and rougher sculpture. From most species having alternately larger and smaller spirals and latticed sculpture it is separated by the more globose body-whorl and the greater difference between the longer and shorter radii, the ratio being about 3 to 1, more or less.

S. ELEGANS Gray. Pl. 51, figs. 15, 16, 10; pl. 53, figs. 78, 79.

Shell oblong, rather depressed, white, black-spotted, showing the pearl through the semitransparent outer coat, closely and regularly spirally striated and concentrically wrinkled. Spire small, conical; whorls rounded, convex; the last very rapidly enlarging. Mouth oblong, spread out twice as wide as the diameter of the last whorl

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but one; the pillar less arched, flattened. The axis imperforated. Throat silvery pearly, smooth. (*Gray.*)

Raine's Island, N. Australia.

S. elegans GRAY, in Appendix to Narrative of the Voyage of H. M. S. Fly ii, p. 359, Marine sh., t. 2, f. 1, 1847.—SOWERBY in Conch. Icon., f. 27*a*, *b*.

Fig. 10, of pl. 51, is copied from Gray's original figure. Figs. 78, 79, pl. 53 are from Sowerby. I have represented on pl. 51, figs. 15, 16, a specimen before me which I believe to be the same species. Compared with *S. sulcifera* it has far more rapidly widening last whorl and wider aperture; the sculpture is much finer. The surface is dull whitish, very irregularly streaked with purplish. The sculpture is scarcely visible (except as fine spiral striæ) except under a lens; then there are seen very numerous unequal or nearly equal spiral threads, slightly crenelated by excessively dense, close incremental elevated striæ, which are irregular, somewhat tortuous and elevated in the inter-liral spaces. The spirals are narrower and the striæ coarser, more distant, on the upper surface; at the periphery the spirals are wider, the striæ of increment excessively fine and close. The aperture is silvery inside, with reflections chiefly of red and blue; the nacre is almost smooth; the columella has a new-moon shaped white tract as in *S. sulcifera*.

Alt. 16, diam. 25 mill.; aperture, breadth 18, oblique alt. 19 mill.; greater radius 20, lesser 6½ mill.

S. LYRATA (A. Ad.) Pilsbry. Pl. 2, figs. 3, 4, 5.

Shell depressed-globose, thin but solid, pinkish, with dots of deep brown or black and white on the spiral riblets. Spire short; sutures deeply impressed; surface of whorls encircled by narrow spiral liræ, separated by spaces about 1 mill. wide (in a specimen of 15 mill. diam.), these interstices closely latticed by oblique raised striæ, and bearing on the last part of the whorl from one to three minute spiral interstitial threads. There are about 16 principal threads on the body whorl of the largest specimen before me, but this character is extremely variable. Whorls 3, convex, the last descending. Aperture large, very oblique, rounded-oval, nacreous, iridescent and slightly sulcate within, corresponding to the sculpture of the outside; columella arcuate, narrow, flattened.

Alt. 11, diam. 15 mill.; aperture oblique alt. 11, breadth 10 mill.

Japan.

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Several specimens of this well-marked form are before me, procured from various sources, and under various names, one of which is *S. lyrata* Ad. I do not find any description of such a species by Adams, and doubt its existence. Specimens of the species now before me were received by Mr. Tryon from Arthur Adams under the name of "*S. elegans* Gray."

S. CUMINGII A. Adams. Pl. 52, fig. 67.

Shell auriform, imperforate; spire depressed; whitish, buff glistening, transversely spirally ribbed, the ribs elevated, subequal, crenelated, articulated with reddish-brown, the interstices ornamented with delicate longitudinal lamellæ; aperture patulous, sulcate within; inner lip subreflexed. This is a large and elegant species, with a peculiar yellowish glistening tinge in the intervals between the spiral rugose ribs; the aperture is very transverse, and the inner lip is reflexed on the columella. (*Ad.*)

Habitat unknown.

S. cumingii AD. P. Z. S. 1853, p. 74; in Thes. Conch. ii, p. 834, t. 175, f. 38.—SOWERBY in Conch. Icon., f. 32.

S. ARTICULATA A. Adams. Pl. 52, fig. 43.

Shell suborbicular, imperforate, convex, thin, grayish, with transverse ribs articulated with black, the interstices with elevated longitudinal lines; spire rather prominent; whorls rounded; aperture oblong oval, longer than wide. (*Ad.*)

Australia; Lord Hood's Island, on pearl oysters; *Japan.*

S. articulata AD., in Thes. Conch. ii, p. 834, t. 174, f. 2.—SOWB. in Conch. Icon., f. 22.—DKR., Ind. Moll. Mar. Jap., p. 145.

Like S. sulcifera in form, but with strongly cancellated sculpture.

S. MACULATA Quoy & Gaimard. Pl. 51, figs. 17, 18, 19; pl. 52, figs. 60, 61.

Shell small, oval, inflated, with rounded prominent spire of 4 whorls. It is very delicately striate longitudinally and transversely, pale yellow, marbled with brown and reddish-brown. The columellar margin is flattened. The regularly oval aperture is nacreous and striate within. Longitudinal diam. 9½, transverse diam. 7 lines. Operculum very thin. (Q. & G.)

Island of Vanikoro; Bet Id., Torres Sts. (Brazier).

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S. maculata Q. & G., Voy. de l'Astrolabe, Zoologie iii, p. 305, t. 66 *bis*, f. 13–16.—*? S. maculata* AD., in Sowb., Thes. Conch. ii, p. 834, t. 175, f. 32–34.—BRAZIER, Proc. Linn. Soc. N. S. W. ii, p. 46.

I am not sure that the *S. maculata* of A. Adams is the same. His figures from the Thesaurus are copied on pl. 52, figs. 60, 61. Specimens were collected on Luzon, Philippines, by Mr. Cuming, according to Adams.

S. MONILIFERA A. Adams. Pl. 53, fig. 92.

Shell suborbicular, convexly depressed, imperforate, whitish, spotted with rufous, and ornamented with transverse close-set granular ribs; aperture oblique, subcircular. (*Ad.*)

Habitat unknown.

S. monilifera AD., P. Z. S. 1850, p. 30; Thes. Conch. ii, p. 834, t. 174, f. 13.—SOWB. in Conch. Icon., f. 7.

S. MALUKANA A. Adams. Pl. 53, fig. 95.

Shell suborbicular, imperforate, convex, transversely sulcate, longitudinally striate, encircled by transversely striated riblets, yellowish brown variegated with rufous-brown, below with reddish and white articulated ribs; spire rather prominent, aperture oval, longer than wide.

This is a solid orbicular rather depressed species, variegated with reddish-brown, and with the whorls adorned with transverse striated ribs. (*Ad.*)

Moluccas.

S. malukana AD., P. Z. S. 1850, p. 31; Thes. Conch. ii, p. 837, t. 174, f. 17.—SOWB., in Conch. Icon., f. 24.

S. CLATHRATULA A. Adams. Pl. 53, fig. 94.

Shell imperforate, turbinate-depressed, spire a little elevated, whorls convex, transversely lirate, articulated with red, crenulated, the interstices closely latticed; umbilical region impressed; columella thick, reflexed; aperture moderate, rounded pearly within. (*Ad.*)

Habitat unknown.

S. clathratula AD., P. Z. S. 1854, p. 133.—SOWB., in Conch. Icon., f. 31.

S. COMPTA A. Adams. Unfigured.

Shell Haliotis-shaped, orbiculate-depressed, brown, vividly iridescent within; spire rather obtuse; whorls convex, longitudinally

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obliquely striated, transversely lirate, the liræ unequal, some more prominent and nodulose; umbilical tract impressed; columella acute, aperture suborbicular.

A well-defined thin brown species, with transverse elevated nodulose liræ and with the interior of the aperture vividly iridescent. (*Ad.*, P. Z. S. 1854, p. 133.)

Habitat unknown.

S. DORIÆ Issel. Pl. 51, figs. 6, 7, 8.

Shell fragile, thin, orbiculate-conoid, much depressed, imperforate, transversely minutely striate-costulate, whitish painted with irregular chestnut spots; spire obtuse; whorls 4, convex, separated by impressed sutures; first narrow, slowly increasing, the last large, rather convex above, rounded beneath; aperture very oblique, large, subrotund; peristome interrupted, acute; columellar margin a little reflexed at the insertion; throat a little pearly.

Alt. 2¾, diam. 4½, diam. apert. 2⅞ mill. (*Issel.*)

Strait of Suez.

Savigny, Descript. de l'Egypte, Coq., t. v, f. 8.—*Stomatella doriæ* ISSEL, Mal. Mar Rosso, p. 228, 1869.

S. SCITULA H. Adams. Pl. 53, fig. 93.

Shell ear-shaped, thin, encircled by numerous unequal riblets, whitish; spire prominent; suture distinct; whorls 4, convex; aperture very oblique, suboval; columella acute, revolute; pearly inside.

Alt. 3½, diam. 5, long. 7 mill. (*Ad.*)

Red Sea.

S. scitula AD., P. Z. S. 1872, p. 10, t. 3, f. 4.

(*Group of S. mariei Crosse.*)

S. MARIEI Crosse. Pl. 53, figs. 68, 69, 70, 71, 72.

Shell depressed, thin, with small, erect, acute spire; color a delicate pinkish fawn, clouded and mottled with reddish-brown, articulated on the spirals with white spots; the base with radiating whitish flames. Surface scarcely shining, sculptured with separated narrow spirals above, and very numerous finer ones covering the spaces between them; striæ of growth excessively close and fine, scarcely visible. The principal spiral threads are articulated white and pink, and a trifle crenulated; base smoother, with separated linear spirals. The spire is short, its outlines concave; apical whorl corneous, projecting, rounded; following whorls of the spire lirate,

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with scalloped sutures; last whorl descending anteriorly, very broad; aperture oval, finely sulcate within, nacreous, the predominant color being silvery or pinkish; columella a little expanded above, over a minute umbilical chink, surrounded by a crescentic opaque white, sharply defined tract.

Alt. 13, diam. 19 mill.; aperture, breadth 12, oblique alt. 11½ mill.; greater radius 13, lesser 6 mill.

New Caledonia.

S. mariei CROSSE, Journ. de Conchyl. 1871, p. 329; 1872, t. 13, f. 13.

The measurements given by Crosse are: alt. 9½, diam. maj. 24, min. 17 mill. The species is larger than *S. sanguinea* and differently sculptured.

A form of this species bearing the (unpublished?) name of *S. Godeffroyi* Dunker, is figured on pl. 1, figs. 12–14. It differs slightly from the type, but probably is not even varietally distinct. The animal is figured on pl. 22, and also in Proc. Phila. Acad. N. S., 1890. The last reference includes a figure of the dentition also.

S. DECOLORATA Gould. Pl. 51, figs. 12, 13, 14.

Shell ear-shaped, depressed, rather rounded in outline, dead white above, with spots of milk-white and blotches of pale sanguineous especially near the suture; whorls 4, forming an acute, moderately elevated spire, somewhat crenulated at sutures; surface conspicuously grooved, those above the periphery having 3 or 4 smaller striæ intervening; beneath somewhat imbricated upwards, and barred in the intervals by the lines of growth, which do not pass over the ridges; one-half the breadth of the base adjoining the columella is plain, without striæ, banded by a raised and milk-white line; a slight reflection of the columella against a minute perforation; aperture transverse, rounded-oval, nearly circular; interior porcelain-white and shining. (*Gld.*) Alt. 13, diam. 22 mill.

Island of Mangsi (=*Mangaia?*).

S. decolorata GLD., Proc. Bost. Soc. N. H. iii, p. 73, 1848; U. S. Expl. Exped. Moll., p. 210, f. 250.

Evidently allied to *S. mariei*, etc. I do not know the locality given by Gould. It may be Mangaia, one of the Cook Islands.

S. ORBICULATA A. Adams. Pl. 52, figs. 44, 45.

Shell depressed, thin, with small acute spire; color greenish-gray, with radiating streaks of reddish, splitting and broken into spots

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below the periphery, the spiral riblets dotted minutely with white. Surface lusterless, sculptured with narrow, acute, slightly granose spiral riblets, their interstices bearing numerous, unequal spiral striæ or threads; decussated by very close, fine striæ of growth; the spiral riblets obsolete in the center of the base. Whorls 5½, the apical 2 smooth, corneous, rounded; the last large, rapidly increasing, briefly descending anteriorly; aperture oblique, oval-quadrate, sulcate within, and pearly, the iridescence chiefly emerald-green within the throat, more silvery on outer lip; columella narrowly reflexed over a minute umbilical chink, bordered by a crescentic white tract.

Alt. 13, diam. 18 mill.; aperture, breadth 12, oblique alt. 11 mill.

Darnley Id., Torres Sts. (Brazier), *Mozambique* (Cuming), *Japan* (Dkr.).

S. orbiculata A. Ad. P. Z. S. 1850, p. 31; Thes. Conch. ii, p. 837, t. 174, f. 23, 24.—Sowerby in Conch. Icon., f. 23.—Brazier, Proc. Linn. Soc. N. S. W. ii, p. 47.—Dunker, Ind. Moll. Mar. Jap., p. 145.

The columella and aperture are quite similar in form to *S. mariei;* but the shell is much less depressed and more coarsely spiralled than that species.

S. RUFESCENS Gray. Pl. 51, fig. 11.

Shell suborbicular, rather depressed, brown. Spire conical, rather acute. Whorls rapidly enlarging, rather convex, concentrically striated with rather unequal acute spiral ridges, the upper whorls with two or three of the ridges larger and higher than the rest, the last with closer, less raised ridges in front. Mouth oblong, two-thirds the diameter of the shell in width, inner lip arched, edge crenulate. Axis imperforated; throat silvery pearly, with a pale reddish edge. (*Gray.*)

Raine's Island, N. Australia.

S. rufescens Gray, in Appendix to Jukes' Narrative of the Voyage of H. M. S. 'Fly,' ii, p. 360, t. 2, f. 2 (1847).

S. SELECTA A. Adams. Pl. 53, fig. 73.

Shell Haliotis-shaped; spire rather prominent; subperforate, greenish, maculated and dotted with red, brown and white; longitudinally obliquely striated, transversely lirated; umbilical region white, smooth; aperture vividly pearly within; columella reflexed above, partly covering the umbilicus.

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This is a species of great delicacy and beauty, most nearly allied to *S. haliotidea* of Sowerby, but with the umbilical region surrounded by a smooth white space and with the columellar margin reflexed and producing the appearance of an umbilicus. (*Ad.*)

Habitat unknown.

S. selecta AD., P. Z. S. 1854, p. 133.—SOWB. in Conch. Icon., f. 29.

S. FULGURANS A. Adams. Pl. 52, fig. 42.

Shell depressed, thin, with small, erect, acute spire; light fawn-colored or grayish, with close narrow oblique stripes of reddish, as wide as their intervals; surface lusterless, sculptured with very close, fine spiral striæ, scarcely visible except under a lens; there are also a few (3 or 4) slightly elevated carinæ on the upper surface. These are scarcely noticeable. There are minute, close striæ of growth, more prominent on the spire. The base is much smoother. Spire acute, apical whorl rounded projecting, brown. Whorls 5, the last very large, scarcely descending anteriorly. Aperture quite oblique, slightly sulcate within, the layer of nacre very thin; columella a trifle expanded at the axis over a minute umbilical chink, bounded by a crescent-shaped white tract.

Alt. 9, diam. 14 mill.; aperture, breadth 9, oblique alt. 8¾ mill.; breadth of columellar white crescent 2¼ mill.

Philippines.

S. fulgurans AD., P. S. Z. 1850, p. 32; Thes. Conch. ii, p. 837, t. 174, f. 12.—SOWERBY in Conch. Icon., f. 1.

Very similar in contour to *S. mariei*, but differing in color and sculpture.

S. SANGUINEA A. Adams. Pl. 53, figs. 85, 86.

Shell depressed, thin, deep crimson colored, with a crescent of white bordering the columella. The sculpture consists of rather narrow, spaced, acute spiral cords, of which there are two larger ones on the upper surface (one at the shoulder), the spaces between occupied by intervening smaller spirals and very close, fine, microscopic spiral striæ, decussated by finer radiating striæ of increment; the upper whorls with low, radiating, scarcely visible folds. The base is nearly smooth, having only fine separated spiral threads with flat inter-spaces, all sculpture becoming obsolete in the white crescent except the fine, very oblique growth-lines. The principal spirals of the upper surface are more or less distinctly beaded; the

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whorls of the spire show only two spiral carinæ. The spire is short, acute. Whorls 4½, the last rapidly enlarging, descending toward the aperture. Aperture extremely oblique, oval, reddish, scarcely iridescent.

Alt. 7, diam. 9–10; of aperture, breadth 7, oblique alt. 7 mill.; greater radius 7, lesser 3 mill.

Ticao, Philippines; Viti Is.; Upolu; Paumotus.

S. sanguinea Ad., P. Z. S. 1850, p. 32; in Thes. Conch. ii, p. 835, t. 174, f. 30.—Sowerby in Conch. Icon., f. 2.—*S. notata* A. Ad. in Thes. Conch., p. 835, t. 174, f. 18–21.—Sowerby in Conch. Icon., f. 12.—Martens & Langkavel, Donum Bismarkianum, p. 49.—*Stomatia depressa* Sowb., Conch. Icon., f. 12, 1874.

May be known by the bright coral red color, or white with longitudinal stripes, usually broken into distinct squarish spots. The principal spirals above are granose. There is an astonishing amount of variation in degree of depression. It is an abundant Polynesian species. The nacreous layer is excessively thin, especially in the typical form.

Var. notata A. Ad. Pl. 52, figs. 48, 49, 50, 51.

White with longitudinal stripes or very distinct crimson or purplish spots, visible also within the aperture. Sometimes unicolored white.

Alt. 6, diam. 9½; alt. 5, diam. 8; alt. 5, diam. 7 mill.

A mere color-form, not separable from the type by any constant characters. The color, size and proportions are very variable, as will be seen by comparing the measurements given. The greater and lesser radii in the most depressed specimen before me measure 3 and 5 mill. The *Stomatia depressa* of Sowerby, pl. 54, figs. 14, 15, seems to correspond with very depressed specimens of *notata* before me.

S. speciosa A. Adams. Pl. 51, fig. 25.

Shell orbiculate-conic, white, spotted with blood-red; transversely keeled, the keels obtuse, prominent, with other smaller keels between them, longitudinally strongly striate. Spire rather prominent, its whorls tri-carinate; aperture oval, pearly within. (*Ad.*)

Grimwood's Island.

S. speciosa Ad., P. Z. S. 1850, p. 32; Thes. Conch. ii, p. 835, t. 174, f. 29.—Sowb. in Conch. Icon., f. 9.

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S. CANDIDA A. Adams. Pl. 53, figs. 88, 89.

Shell suborbiculate, depressed, white, transversely carinate all over, the riblets small, close, very numerous, a little elevated, subnodulose; interstices very delicately striate; spire rather depressed; whorls rounded; aperture oblique, subcircular, longer than wide.

A pure white species, orbiculately depressed, with numerous acute keels on the whorls, and with the spaces between the ribs finely striated. (*Ad.*)

Corean archipelago, on coral reefs.

S. candida Ad., in Thes. Conch. ii, p. 136, t. 174, f. 22.—SOWB. in Conch. Icon., f. 8.

S. HALIOTOIDEA Sowerby. Pl. 52, figs. 40, 41.

Shell Haliotis-shaped, thin, apex acute, brown, painted with varied white and rufous, sometimes whitish spotted with green; whorls rather flattened, transversely lirate, the liræ close, rather roughened; umbilical region impressed, scarcely rimate; aperture rounded-oval, oblique.

Shell rather orbicular, with an acute apex, transversely lirate, and variously colored with red, green, brown and white. (*Ad.*)

Philippines.

S. haliotoidea (Sowb.) A. ADAMS, in Thes. Conch. ii, p. 837, f. 174, f. 10, 11.—SOWB., in Conch. Icon., f. 4.

S. JAPONICA A. Adams. Pl. 53, fig. 97.

Shell suborbicular, imperforate, convex, brown, transversely costulate, the riblets close, noduled, the interstices very finely longitudinally striated; spire rather prominent; whorls costate, rounded; aperture subcircular, pearly within.

The aperture in this species is subcircular, and the whorls are rounded and transversely ribbed; the color is brown, and the ribs are nodulous and close-set. (*Ad.*)

Japan.

S. japonica AD., P. Z. S. 1850, p. 31; Thes. Conch. ii, p. 838, t. 174, f. 14.—DUNKER, Moll. Jap., p. 23.—SOWB., in Conch. Icon., f. 6.

S. PALLIDA A. Adams. Pl. 53, fig. 82.

Shell suborbicular with acuminate spire, white, painted with pale longitudinal rays, transversely lirate, the interstices decussately

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striate; aperture transverse, suboval, porcelaneous within; inner lip nearly straight, callous.

A species somewhat resembling in coloring striped varieties of *S. notata*, but which differs materially in form and sculpture. (*Ad.*)

Lord Hood's Island.

S. pallida AD., P. Z. S. 1850, p. 36; Thes. Conch. ii, p. 838, t. 175, f. 44.—SOWB. in Conch. Icon., f. 19.

S. BICARINATA A. Adams. Pl. 52, figs. 53, 54.

Shell turbinate, umbilicate; spire produced; buff, ornamented with radiating green maculations; whorls rather flattened, angular above, the last with two elevated carinæ; transversely spirally striate; aperture moderate, subtetragonal; columella straight, scarcely callous anteriorly.

This is a very pretty species, with a deep umbilicus and straight columella; the whorls are furnished with prominent keels, of which there are two on the last whorl; the shell is ornamented with green blotches. (*Ad.*)

Moreton Bay, Australia.

S. bicarinata AD., in Thes. Conch. ii, p. 839, t. 175, f. 39, 40.—SOWB. in Conch. Icon., f. 25.

Perhaps is not a Stomatella. Compare *Gibbula coxi* Angas.

S. BIPORCATA A. Adams. Pl. 52, fig. 52.

Shell turbinate, subdepressed, red and white, obscurely variegated, transversely sulcate; spire acuminate, whorls 4, the last with two prominent ridges; aperture subquadrate, pearly within; inner lip nearly straight; outer lip bi-angulate in the middle; umbilicus covered by a callous.

A small red species, with two rounded ridges on the last whorl, and with a subquadrate aperture. (*Ad.*)

Australia.

S. biporcata AD., P. Z. S. 1850, p. 33; Thes. Conch. ii, p. 839, t. 175, f. 43.—SOWB. in Conch. Icon., f. 21.

S. TIGRINA A. Adams. Pl. 53, fig. 84.

Shell orbiculate-conic, perforate, whitish, ornamented with radiating red stripes, bicarinate, carinæ rather elevated obtuse, transversely striate, striæ regular; spire prominent, whorls angular; aperture subcircular; inner lip subreflexed, callous; umbilicus distinct, nearly covered.

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White, umbilicated, with radiating fuscous bands; whorls with two elevated obtuse, transversely striated keels. (*Ad.*)

Habitat unknown.

S. tigrina AD., P. Z. S. 1850, p. 33; Thes. Conch. ii, p. 839, t. 175, f. 37.—SOWB. in Conch. Icon., f. 18.

S. ARABICA A. Adams. Pl. 52, figs. 57, 58.

Shell ovate-globose, subturbinate, umbilicate, white closely variegated with red; spire produced; whorls lirate, the last ventricose, convex, transversely striated; aperture open, suboval; columella oblique; umbilical region impressed; lip white, thin, reflexed, partly covered the umbilicus.

This is a small species, with the whorls round and simply striated; the color and markings vary; the ground however is usually white, with large irregular blotches. (*Ad.*)

Red Sea.

S. arabica AD., P. Z. S. 1853, p. 74; Thes. Conch. ii, p. 836, t. 174, f. 27, 28.—SOWB., Conch. Icon., f. 14.

S. MARGARITANA A. Adams. Pl. 51, fig. 22.

Shell turbinate; spire elevated; whorls rounded, red, longitudinally striate, transversely costulate, costulæ subnodose, unequal; aperture suborbicular; pearly within; lip semicircular; umbilicus covered by a callous.

A small red, transversely ribbed species, having very much the appearance of a *Margarita*. (*Ad.*)

Australia.

S. margaritana AD., P. Z. S. 1850, p. 33; in Sowb., Thes. Conch. ii, p. 839, t. 174, f. 31.—SOWB. in Conch. Icon., f. 17.

S. CALLIOSTOMA A. Adams. Pl. 53, figs. 80, 81.

Shell ovate-subturbinate, rimate; spire depressed; reddish, variegated with brown, transversely lirate, liræ elevated, unequal; aperture transversely oval, rosy within, iridescent; inner lip thin, acute, arcuate.

The interior of the aperture in this species is of a beautiful reddish or violet tint; externally the whorls are spirally lirate, and of a dull reddish-brown, variegated with markings of a darker color. (*Ad.*)

Ceylon.

S. calliostoma AD., P. Z. S. 1853, p. 74; Thes. Conch. ii, p. 840, t. 175, f. 41, 42.—SOWB. in Conch. Icon., f. 33.

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S. MODESTA H. & A. Adams. Pl. 53, fig. 83.

Shell subcircular, imperforate, depressed, spire small; whorls convex, transversely lirate, liræ unequal, articulated with gray, some of them stronger; aperture ovate, oblique, vividly iridescent-white within, clouded with gray.

A neat lirate species, clouded with pale gray, and a few darker blotches at the sutures. (*Ad.*)

Red Sea?

S. modesta AD., P. Z. S. 1863, p. 433.—SOWB. Conch. Icon., f. 34.

S. ELATA H. & A. Adams. Pl. 58, fig. 90.

Shell orbiculate-conic, imperforate; spire elevated, whitish, radiately painted with brown at the sutures, ornamented with subquadrate brown spots at the periphery; transversely lirate, liræ unequal, articulated with brown; aperture subcircular, inner lip subcalloused, reflexed. (*Ad.*)

Habitat unknown.

S. IRISATA Dufo. Unfigured.

Animal covering a part of the shell with the mantle edges; exterior black.

Shell very depressed, ear-shaped; spire little elongated, but apparent; aperture rounded, wider than long; right margin striate within; surface striate and granulate, white, with black bands and red points; left side white; interior subnacreous, with greenish bands. (*Dufo.*)

Id. of Mahé, Seychelles.

Dufo, Ann. des Sci. Nat. 1840, p. 201.

S. MINIMA Dufo. Unfigured.

Shell depressed, ear-shaped; spire little conspicuous; aperture oval, much wider than long; the right margin smooth and acute, the left smooth and flat; outer surface not striate, white marbled with red; interior not nacreous. (*Dufo, l. c.*)

Mahé, Seychelles, on Avicula margaritifera, in 6 fms.

Probably a *Gena*, allied to *G. lævis* and *G. lutea*.

S. NIGRA Anton. Unfigured.

Obliquely oval, convex; spire small, lateral; black, the margins red-and-white striated; aperture oval-rounded, inner volutions

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scarcely visible; mouth slate-gray, the margins spotted with red and white. Breadth 1½, length 2 lines. (*Anton.*)

Persian Gulf? on pearl oyster.

Probably a *Gena.*

B. Antillean species.

S. COCCINEA A. Adams. Pl. 52, figs. 55, 56.

Shell perforated, small, depressed, with short, conical spire; deep crimson with a white umbilical crescent, and often white spots at the periphery. The surface is slightly shining, encircled by numerous raised spirals, of which every 4th one is larger; midway between these are smaller ones, and there are still finer spiral striæ occupying the interstices; the whole decussated by fine striæ of growth. There is an angle or carina midway between the periphery and suture of the last whorl, which angulates the spire whorls. Spire short, conic; suture impressed. Whorls 4, the apex smooth, white; the last rapidly enlarging, subangular at periphery. Aperture red within, oblique; inner lip gently curved, narrowly reflexed over but not concealing the umbilical chink. Umbilical tract white, impressed. Color, deep crimson, under a lens seen to be minutely, closely articulated with lighter, especially on the spire, and often with a series of white dots scattered along the periphery. Alt. 3, diam. 4 mill.

St. John's (Cuming), *St. Thomas, and St. Croix, W. Indies.*

S. coccinea A. AD., P. S. Z. 1850, p. 33; Thes. Conch. ii, p. 840, t. 175, f. 35, 36.—SOWB. in Conch. Icon., f. 26.—KREBS, The West Indian Marine Shells, p. 85.

A very distinct coral-red species, with white tipped apex and white umbilical crescent. The following seems to be a variety.

Var. RUBROFLAMMULATA Pilsbry. Pl. 2, figs. 1, 2.

Shell with the same sculpture and form; umbilicus quite evident; whorls of the spire minutely plicate just above the sutures; color white, with large, irregular red tracts or spots below the periphery.

Alt. 4, diam. 5 mill.

St. Thomas.

This beautiful color-variety is very variable in markings. The figures represent the most usual pattern. Other shells have large irregular radiating flames above the periphery, which under a lens are seen to be of an olivaceous tint, veined and dotted throughout with red; the base closely red-articulated. Another specimen is

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deep brown, almost black, with snowy-white spire, and umbilical tract.

S. DELICATA H. & A. Adams.

Shell orbiculate-conic, imperforate, the spire rather elevated, variegated snowy and pale green, sparsely spotted with blood-red; transversely lirate, with more prominent distant liræ; upper whorls uni-carinate; aperture ovate, oblique, white within. (*Ad.*)

A delicate species, varied with snow-white and pale green, with a few blood-red spots. (*Ad.*)

St. Thomas.

S. delicata H. & A. AD., P. Z. S. 1863, p. 432.

Were it not for the "testa imperforata" of Adams' description I would unhesitatingly refer the specimens I have described above as Var. *rubroflammulata* to this species; for the coloration of my variety is sometimes precisely that attributed to *delicata*. It is not impossible that Sowerby's "*S. dilecta* H. Ad." is intended for *S. delicata* H. & A. Ad.

S. DILECTA (H. Ad.) Sowerby. Pl. 53, fig. 91.

Shell trochiform, rather rosy, painted with red spots in rows; spire prominent, whorls roundish; last whorl biangular, belted with strong ribs at the angles; interstices striated. Resembling *S. modesta* in the markings, but more trochiform. (*Sowb.*)

Habitat unknown.

S. dilecta ("H. Ad.———?") SOWERBY, in Conch. Icon., f. 30.

Section *Synaptocochlea* Pilsbry, 1890.

This is a group of little shells, more elongated than *Stomatella* with larger body-whorl and aperture and smaller spire. They are like the typical *Stomatiæ* (*phymotis, australis*) in contour, but have no nodose keels, being simply spirally striate or slightly granose. They are scarcely more spiral than *Gena*, but some of them are known to have opercula, wanting in that genus. The species have been pretty impartially distributed in *Gena* and *Stomatella* by authors. *S. montrouzieri* Pilsbry, (*picta* Montr. not Orb.), may be considered the type.

S. STELLATA Souverbie. Pl. 53, figs. 76, 77; pl. 2, figs. 35, 36, 37.

Shell ear-shaped, with minute spire and very large, convex body-whorl; surface somewhat shining, black with scattered whitish dots,

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spots or zigzag lines; sculptured by numerous close microscopic spiral striæ, several smaller alternating with larger ones, and somewhat decussated by impressed growth lines. The spire is very short with minute whitish nucleus; whorls 3½, convex, the last very large. Aperture ovate, angled above, polished, and bright inside, and of a blue color. Columella arched; a slight chink is at the place of the umbilicus.

Alt. 7½, breadth 5½; aperture, length 5½, breadth 5 mill. Measured as directed for *Gena* on p. 37.)

New Caledonia; Viti Is.; Barnard Id. No. III, N. E. Australia.

S. stellata SOUVERBIE, Journ. de Conchyl. 1863, p. 169, t. 5, f. 10. —*S. ornata* BRAZIER, Proc. Linn. Soc. N. S. W. ii, p. 47 (1877).

The color is very dark ("nigrescente plumbea") in this species, sparcely dotted with white; but the dots are as often replaced by spots, or V-shaped markings. On these the lip is edged with a row of white dots. Color-varieties in the collection before me are figured on pl. 2, figs. 35–37. It is this variability that causes me to consider Mr. Brazier's *S. ornata* a variety of *stellata*. Its sculpture is the same as the type—fine spirals with several still finer ones interposed, decussated by growth-striæ; color, "undulated brown, white and pink flames, sometimes in the form of lengthened spots." Locality, Barnard Is., N. E. Australia.

From the Viti Islands I have a smoother form, with the minuter spiral striæ obsolete. The color is sepia or umber-brown *or pink*, with numerous spots and V-shaped marks of white. It may be called variety *ornatissima*. (pl. 2, figs. 35–37.)

S. CRASSA Montrouzier. Pl. 55, figs. 22, 23.

Shell ovate-oblong, thick, back convex, with radiating, impressed striæ of growth decussated by spiral subelevated striæ; dull ashen-blackish, scarcely shining; spire lateral, prominent; whorls 4, convex, separated by impressed sutures, the last one forming the greater part of the shell. Aperture ample, rounded-ovate, bluish-white and shining inside; right margin acute, left subarcuate, appressed at the columella and united with the right lip. Length 10½, width 6 mill.; alt. 4½ mill.; aperture 7 mill. long, 5 broad. Measurements of another specimen, length 8½, breadth 5, alt. 4 mill.; aperture 6 by 4 mill. (*Montr. & Souv.*)

Island of Art, New Caledonian Archipelago.

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Stomatella (*Gena?*) *crassa* MONTR., Journ. de Conch. 1870, p. 74, t. 9, f. 6.

S. MONTROUZIERI Pilsbry. Pl. 53, figs. 74, 75.

Shell small, ovate, back convex, transversely striated, the striæ decussated by slightly elevated spiral striæ, with smaller ones between them; deep opaque black, obliquely girdled with white; spire lateral, slightly prominent; whorls 4, separated by impressed sutures, rounded, the last forming the greater part of the shell; aperture ample, rounded-ovate, somewhat dilated below, shining within, concolored, with very translucent white bands; right margin acute, left subthickened, arcuate, reflexed posteriorly, and appressed; umbilicus a very narrow fissure. Operculum corneous, rounded, very thin.

Length 4½, width 3, alt. 2½ mill.; aperture, 3½ mill. long. (*Montr.*)

Id. of Art, New Caledonian Archipelago.

Stomatella picta MONTROUZIER, Journ. de Conchyl. 1862, p. 239, t. 9, f. 7 (not *S. picta* d'Orbigny, a species of quite similar form).

S. CALIGINOSA H. & A. Adams. Pl. 55, fig. 26.

Shell ear-shaped, imperforate, oblong, blackish; spire small, transversely lirate, larger and smaller liræ alternating, obsoletely articulated with white; aperture oblong, very oblique, greenish-white within, margin crenulate, black; inner lip rather flattened; a narrow lunar umbilical rimation. Operculum thin, orbicular, multispiral. (*Ad.*)

A brownish-black lirate auriform species, more resembling a *Gena* but with the operculum of *Stomatella*. (*Ad.*)

Habitat unknown.

S. caliginosa AD., P. Z. S. 1863, p. 434.—*Gena caliginosa* Ad., SOWB., Conch. Icon., f. 10.

S. GRANOSA Lambert. Pl. 51, figs. 23, 24.

Shell small, thin, subtranslucent, ovate-oblong, the back convex; spire lateral, short, prominent; transversely impressed-striate, the striæ gathered at and radiating from the suture on the last whorl, spirally granulose-costate and impressed striate, with an interstitial crenulated riblet between the spiral ribs; scarcely shining, sub-reddish-black, smooth inside, shining, bluish; whorls 4, rounded, separated by impressed sutures, the first two (embryonic) white, smooth, the last forming the larger part of the shell. Aperture

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rounded-ovate, within subsulcate and whitish radiate, columellar margin subthickened, white, right margin simple.

Long. 5½, lat. 4, alt. 2 mill.; aperture 4 mill. long, 3 broad. (*Lambert.*)

Loyalty Is., New Caledonian Archipelago.

Stomatella granosa LAMBERT, Journ. de Conchyl. 1874, p. 374; loc. cit. 1875, t. 4, f. 2.

✓ S. CONCINNA Gould. Pl. 2, figs. 6, 7; pl. 55, figs. 27, 28.

Shell small, with large, oval body-whorl and minute spire; surface covered with equal spiral riblets, separated by interstices nearly as wide as themselves, and cut into tiny, compressed beads by close, regular impressed lines of increment. Color white, with oblique spiral bands of red, frequently broken or splitting. Spire extremely minute, of 3–4 whorls; aperture roundly oval, white and showing pink stripes within.

Alt. 4, diam. 3½ mill.; aperture, alt. 3½, width 2⅞ mill.

Sandwich Is.; Paumotus.

Stomatella concinna GLD., Proc. Bost. Soc. N. H. ii, p. 26, 1845.—*Gena concinna* Gld. ADAMS in Thes. Conch. ii, p. 831, t. 173, f. 20, 21.

A pretty little shell. The deep red color of the stripes does not extend into the inter-liral grooves, being confined to the riblets. One specimen before me is unicolored deep purple-brown, with a pink-edged columellar crescent of white.

✓ S. PULCHELLA A. Adams. Pl. 2, figs. 32, 33, 34.

Shell convexly depressed, oval, white, spotted with red; back convex, all over striated; spire rather prominent, whorls rounded; aperture large, oval, pearly and iridescent within. (*Ad.*)

Habitat unknown.

Gena pulchella AD., P. Z. S. 1850, p. 38; Thes. Conch. ii, p. 831, t. 173, f. 17, 18, 19.

S. ASPERULATA A. Adams. Pl. 55, figs. 24, 25.

Shell haliotis-shaped, back convex; rufous-brown, ornamented with a broad white girdle; decussated by elevated rather close-set lines and oblique striæ; spire posterior, rather prominent, white; aperture long, oval. (*Ad.*)

Habitat unknown.

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Gena asperulata AD., P. Z. S. 1850, p. 38; Thes. Conch. ii, p. 830, t. 123, f. 28, 29.

May be a true *Gena*, but the sculpture and form are more like the present group.

S. PICTA d'Orbigny. Pl. 54, figs. 19, 20; pl. 21, figs. 22–25.

Shell minute, ear-shaped, with large oval body-whorl and minute spire; surface shining, encircled by very numerous, fine, unequal spiral threads, cut into close but indistinct granules by close impressed longitudinal striæ. Flesh colored, the spirals dark red; spotted and longitudinally maculate with opaque snowy-white; columella white; spire minute; whorls 2½, the last large, oval, descending. Aperture ovate, angular above, maculate within.

Greatest length 4, greatest breadth 2¼ mill; aperture, alt. 3, breadth 2 mill.

St. Thomas and Cuba; Florida Keys.

Stomatia picta ORB., Moll. Cuba ii, p. 184, t. 24, f. 19, 21.—*Stomatella picta* Orb., DALL, Bull. 37, U. S. Nat. Mus., p. 168, 1889.

This species is usually a little smaller than the measurements given above. About 30 specimens from St. Thomas are before me. There is considerable variation in the intensity of the color, one specimen being unicolored black, reddish on the spire. I have not seen specimens truncated below as d'Orbigny's figures show his to have been. It is reported from the Florida Keys by Dall and by Simpson. *S. concinna* Gld., is a very similar species.

Subgenus NIPHONIA A. Adams.

Niphonia AD., Annals and Magazine of Natural History, 3d ser., vi, p. 336, 1860. Type, *N. pulchella* A. Ad.

This little genus most nearly resembles *Stomatella*, but the shell is very thin, and the aperture has an internal ledge, as if for the operculum. Two specimens only were obtained, both dead, and both wanting the opercula. (*Ad.*)

N. PULCHELLA A. Adams.

Shell smooth, pale brown, shining, spirally lirate; whorls 2½, convex; the last having five larger transverse liræ and many smaller basal ones; umbilical region impressed; margin of peristome acute. (*Ad.*)

Off Mino-Sima, Corea Strait, 63 fms.

N. pulchella AD., Ann. Mag. N. H. 1860, p. 336.

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Genus PHANETA H. Adams, 1870.

Phaneta H. AD., P. Z. S. 1870, p. 793.—TRYON, Struct. and Syst. Conch. ii, p. 317.—FISCHER, Manuel de Conchyl., p. 839.

The animal is unknown. The genus was placed by Adams in the *Valvatidæ*, probably because it is a fluviatile mollusk. Tryon first placed it in the *Stomatellidæ*, and is followed by Fischer, who places the group between *Stomatella* and *Gena*. It is not known whether an operculum is developed, but I regard it as likely.

P. EVERETTI H. Adams. Pl. 1, figs. 18, 19, 20.

Shell depressed-trochiform, rather thin, whitish, covered with a thin pale reddish epidermis; spire convex-conic, apex obtuse, sublateral; suture distinct; whorls 3, slightly convex, rapidly increasing, ornamented with obscure oblique striæ and some irregular spiral ones; the last whorl acutely carinated; base subconcave, the columellar region excavated, closely concentrically striated.

Alt. 6, diam. maj. 8½, min. 7½ mill. (*Ad.*)

Siniwan River, Borneo, near Sarawak; attached to submerged logs.

Phaneta everetti H. AD., P. Z. S. 1870, p. 794, t. 48, f. 20.

Genus STOMATIA (Helbling) Lamarck, 1801.

Stomatia HELBLING 1779.—*Stomatia* LAMARCK, Syst. des Anim. s. Vert. et Tab. gen. etc., p. 96. Type, *S. phymotis* Helbl.—*Stomax* MONTFORT Conch. Syst. ii, p. 110, 1810.

Stomatia is closely allied to *Stomatella*, differing in the generally more elongated shell with a series of short folds or puckers below the sutures; usually the body-whorl has a tuberculous carina; there is no operculum typically. I am prepared however to learn that some of the species are operculate. The animal is too large to entirely enter the shell; the foot large, fleshy, tubercular, greatly produced posteriorly; epipodium fringed, with a more prominent fimbriated lobe behind the left tentacle, and on the right there is a slightly projecting fold or gutter leading to the respiratory cavity. There are digitated inter-tentacular lobes.

S. PHYMOTIS Helbling. Pl. 54, figs. 16, 17, 21, 22.

Shell Haliotis-shaped, lengthened, with scalar spire, the last whorl very deeply descending; solid, lusterless, red, marked at suture, keel and base with olive or brown articulated with white. Surface very rough, with a strong double nodulous keel at the middle of the

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whorl, several nodose spiral riblets and threads below it, strongly plicate or puckered below the sutures. Aperture irregular-oval, nacreous inside.

Alt. 28 mill.; of aperture, alt. 22, breadth 14 mill.

Philippines; Viti Is.; Japan.

Stomatia phymotis HELBLING, Beiträge zur Kenntniss neuer und seltener Conchylien, in Abhandlungen einer Privat-gesellschaft in Böhmen zur Aufnahme der Mathematik, der Vaterländischen Geschichte und der Naturgeschichte, iv, Prague, 1779, p. 124.—VON MARTENS in Mal. Blätter, xvi, p. 236.—A. ADAMS, in Thes. Conch. ii, p. 841, t. 175, f. 48–52.—SOWB. in Conch. Icon., f. 2.—LAM., An. s. Vert., vi, p. 211.—DUNKER, Ind. Moll. Mar. Jap., p. 146.—*Stomax furonculus* MONTF., Conch. Syst. ii, p. 111.

S. australis AD., P. Z. S. 1850, p. 34.—Sowb., Conch. Icon., f. 1.—*S. obscura* "Lam." SOWB., Conch. Icon., f. 3.—*S. obscurata* LAM., An. s. Vert. vi, p. 212.—DELESSERT, Rec. de Coq., t. 33, f. 5.

The largest, most strongly tubercled species. There is considerable variation in both form and color. Figs. 21, 22, of pl. 54, represent the form called *S. obscura* "Lam." by Sowerby and others. It is probably *S. obscurata* Lam.

Var. AUSTRALIS A. Adams. Pl. 54, figs. 1–3, 34.

Smaller than the type, shorter, with shorter, less scalar spire; surface with sharp, unequal spiral threads, tubercled and plicate as in *S. phymotis*, or sometimes nearly smooth except for the fine spirals. Color greenish-yellow, pale red, or variegated.

Alt. 20 mill.; aperture, alt. 15, breadth 11 mill.

S. DUPLICATA Sowerby. Pl. 54, figs. 4, 5, 8, 9, 10.

Shell depressed-globose, with conical spire; longitudinally striped with purplish or red and white. Rather solid; surface with numerous fine, unequal spiral threads above, two strong nodose keels at periphery, and about 7 subequal liræ on the base, their interstices spirally striate; spire prominent; whorls 3, bicarinate, the last notably so, concave above the carina, plicate below the sutures; aperture rounded, oblique; columella concave, thin; umbilical tract a little grooved, white.

Alt. 14, diam. 14 mill.; alt. 10, diam. 10 mill.

Philippines.

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S. duplicata SOWB., Genera, *Stomatia* f. 3.—A. ADAMS in Thes. Conch. ii, p. 841, t. 175, f. 61–63.—SOWB., in Conch. Icon., f. 11.

Far more depressed than *S. phymotis* or *australis*. The strongly marked double *nodose* keel will separate it from the following.

S. ACUMINATA A. Adams. Pl. 54, fig. 18.

Shell Haliotis-shaped, suborbiculate, rather brown, cancellated, transversely costate, ribs 3, prominent, middle one very prominent, tuberculate; strongly plicate at the suture, longitudinally elevately striate; spire rather prominent, acuminate; whorls 4, angular; outer lip with 3 angles.

This is a cancellated, transversely-ribbed species, strongly plicate near the suture. (*Ad.*)

Philippines Is.

S. acuminata AD., P. Z. S. 1850, p. 34; Thes. Conch., p. 843, t. 175, f. 64.—SOWB. in Conch. Icon., f. 7.

S. DECUSSATA A. Adams. Pl. 54, fig. 12.

Shell ovate-oblong, longitudinally and transversely decussately striate, with 2 simple or subtuberculated angular, prominent carinæ; pale, varied with brown spots; spire elevated; aperture oblique, nearly circular, lip biangulate in the middle.

This species is decussated with transverse and longitudinal striæ, and there are two prominent, angular, keels on the whorls; the spire is acute and prominent. (*Ad.*)

Luzon, Philippines.

S. decussata AD., P. Z. S. 1850, p. 34; Thes. Conch. ii, p. 843, t. f175, . 60.—SOWB., in Conch. Icon., f. 6.

S. ANGULATA A. Adams. Pl. 54, fig. 6; pl. 51, figs. 29, 30.

Shell depressed, thin but rather solid, with very short, conical spire; greenish-gray, obscurely longitudinally striped with dull, pale reddish-brown; surface lusterless, with numerous unequal spiral threads, latticed by wavy riblets of growth; the whorls encircled by two strong carinæ above, and numerous smaller liræ below the periphery; and with strong, short subsutural folds. Whorls 3½, the last large, depressed, impressed at the place of umbilicus. Aperture oblique, subrotund.

Alt. 7, diam. 9 mill.; aperture, alt. 6½, breadth 6½ mill.

Luzon, Philippines.

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S. angulata A. Ad., P. Z. S. 1850, p. 34; Thes. Conch. ii, p. 842, t. 175, f. 57.—Sowb., Conch. Icon., f. 10.

A small species, intermediate in characters between *S. duplicata* and *S. rubra*.

S. rubra Lamarck. Pl. 54, figs. 31, 32, 33; pl. 51, figs. 26, 27, 28.

Shell depressed, with small, conical spire; rather thin; reddish brown, lighter beneath, or variously variegated. Surface covered with close fine hair-like spiral striæ, and with two low keels above the periphery, the upper one nodose; there is a series of short folds below the suture. Whorls of spire with a beaded carina; last whorl wide, depressed, flattened above, convex below, and impressed at the axis; aperture large, rounded, very oblique, iridescent within.

Alt. 11, diam. 15½ mill.; aperture, oblique alt. 9½, breadth 10 mill.

Philippines; Strait of Corea.

S. rubra Lam., An. s. Vert. (ed. Desh.) ix, p. 16.—Encycl. Méth., 450, f. 3.—Adams in Thes. Conch. ii, p. 842, t. 175, f. 53–56.—Sowb., Conch. Icon., f. 8.—Dunker, Ind. Moll. Jap., p. 146, t. 6, f. 11–13.

Differs from all the preceding in the more depressed body-whorl, which is much like some species of *Stomatella* of the group of *S. mariei*. The surface has very fine regular hair-like spiral striæ above. The following species seem to be very closely allied.

S. lirata A. Adams. Pl. 54, figs. 23, 24.

Shell orbiculate-convex, provided with transverse subequal elevated, slightly nodulose liræ, the interstices strongly longitudinally striate; subplicate at the sutures; pale, radiately marbled with brown; spire rather prominent; whorls rounded; aperture oblique, oblong-oval; lip convex, rotund. (*Ad.*)

Habitat unknown.

S. lirata Ad., P. Z. S. 1850, p. 35; Thes. Conch. ii, p. 842, t. 175, f. 58, 59.—Sowb., Conch. Icon., f. 9.

S. decorata A. Adams. Pl. 54, fig. 7.

Shell Haliotis-shaped, orbiculate-depressed, covered-umbilicate; whorls of the spire bicarinate, transversely sulcate and striate, obliquely plicate at the sutures, the last whorl unicarinate; aperture white inside, opaque, pearly; color brownish-buff, dotted and spotted with red.

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This is a large and showy species, somewhat resembling *S. rubra* Lam., in the character of the markings and color; it is not tubercular like that species. (*Ad.*)

Stomatia decorata AD., P. Z. S. 1854, p. 132, t. 28, f. 2.

This species and *S. splendidula* I have not seen. They seem to be near to *S. rubra* Lam.

S. SPLENDIDULA A. Adams. Pl. 52, figs. 36, 37.

Shell Haliotis-shaped, orbicularly depressed, imperforate; whorls of the spire 3, bicarinate, the last whorl transversely lirate, liræ unequal, roughened, the interstices longitudinally striated; pale above, with radiating reddish-brown flames at the sutures, below reddish dotted with brown; base ornamented with red radiating flames. Aperture white and opaque within, with bright green lines, margin pearly.

In this species the columellar margin is reflexed and pearly, but the interior of the aperture, with the exception of the internal margin of the outer lip, is opaque white, with green spiral lines. (*Ad.*)

Japanese Sea (Adams); *Paumotus* (Martens).

S. splendidula AD., P. Z. S. 1854, p. 133; Thes. Conch. ii, p. 838, t. 174, f. 15, 16.—DUNKER, Ind. Moll. Mar. Jap., p. 145.—SOWB. in Conch. Icon., f. 15.—MARTENS & LANGKAVEL, Donum Bismarkianum, p. 48.

S. VARIEGATA H. Adams. Pl. 54, fig. 13.

Shell subrimate, oval-oblong, convex, transversely costate, the costæ subdistant, interstices longitudinally striated, red, varied with white; spire rather prominent; apex acute; suture distinct; whorls 3½, convex; aperture oval, inner lip callous, outer lip ascending a little. Alt. 9, diam. 7 mill. (*H. Ad.*)

Mauritius.

Stomatia variegata H. AD., P. Z. S. 1868, p. 12, t. 4, f. 1.—SOWB. in Conch. Icon., f. 5.

S. PALLIDA Tapparone Canefri.

Shell thin, spirally encircled by delicate unequal liræ, depressed and plane above; spire a little elevated, acute, grayish-white, longitudinally painted with pale brown streaks; whorls 4, separated by a distinct suture, sutural folds little conspicuous; last whorl large, flat above, depressed at the suture, spirally ornamented with sharp elevated striæ and two spinous-tuberculate carinæ; very con-

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vex beneath transversely finely granose-cingulate, and sculptured with longitudinal elevated, distant, obsolete, flexuous, very oblique striæ decussating the cinguli; aperture moderate, ovate-rounded; throat pearly, marked with blackish spots.

Alt. 3½, diam. 6½ mill. (*Canefri.*)

Sorong.

Stomatia pallida TAPP. CAN., Annali del Museo Civico di Storia Naturale di Genova ix, p. 288, 1877.

Subgenus MICROTIS H. & A. Adams.

Microtis ADS., P. Z. S. 1850, p. 36.—*Microtina* ADS. *olim.*—*Microtina* Ads., CROSSE, Journ. de Conchyl. 1871, p. 188.

The animal of *Microtis* is like *Stomatia*, but the foot has a deep anterior fissure for the snout, the front edge bilobed. There is no operculum.

M. TUBERCULATA H. & A. Adams. Pl. 54, figs. 25, 26, 27.

Shell tuborbicular, ear-shaped, greatly depressed, variegated with green, transversely striated, bicarinated; keels tuberculated, nodosely plicated near the suture; spire scarcely elevated, whorls carinated; aperture large, oval, pearly within, with two concentric parallel grooves. (*Ad.*)

Is. of Capul, Philippines, on the sands, high water.

M. tuberculata ADS., P. Z. S. 1850, p. 36.—AD. in Thes. Conch. ii, p. 841, t. 175, f. 45–47.—*Stomatia tuberculata* A. Ad., SOWB. in Conch. Icon., f. 4.—*Microtina tuberculata* Ad. CROSSE, Journ. de Conchyl. 1871, p. 191.

Adams' figures of the animal of *M. tuberculata* are reproduced on pl. 54, figs. 28, 29, 30.

M. COMPTA Martens & Langkavel.

Pale greenish-yellow, with blackish zigzag stripes. Ribbed like *Stomatella notata* Ad., but the prominent ribs are stronger, with large white and blackish spots. The last whorl less depressed than in *S. notata*. Columellar margin thickened, nacreous, so broadly concave that one can see almost the entire second whorl within it, from beneath, as in *Microtis tuberculata*, while this is not the case with *S. notata* or *S. splendidula*. 10 mill. in greater diameter, 7 high, aperture 7½ mill. Distinguished from *M. tuberculata* Ad. by the rounded shell, with less prominent spiral keels. In all of these species the inter-liral spaces are finely spirally striated; and oblique

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lines parallel to the lip-margin pass over the ribs and interstices. The interior of the mouth is furrowed and beautifully nacreous. (*Mart. & Langk.*)

Paumotus.

Microtis compta M. & L., Donum Bismarckianum, eine Sammlung von Südsee-Conchylien, p. 49, 1871.

M. HECKELIANA Crosse. Pl. 51, figs. 33, 34, 35.

Shell suborbicular, haliotis-shaped, very much depressed, flattened, very finely striate spirally, whitish, with little longitudinal stripes of light brown on the base, not very obvious, and slightly undulating, their edges serrate (déchiquetés) in a peculiar way, and more pronounced in the central part of the stripes. Spire excessively depressed, completely flat or a little concave; suture well-marked, provided with nodose folds or denticulations moderately spaced. Whorls of the spire 3, flat; last whorl large, with two spiral series of undulations above, then obtusely carinated, becoming convex on the base. Aperture large, oval, auriform, brilliantly nacreous within. Columella forming a spiral visible as far as the apex of the shell, white and shining. Peristome simple, basal and outer margins acute; outer margin angular and strongly receding below.

Alt. 3½, diam. maj. 11, min. 8 mill. (*Crosse.*)

Noumea, New Caledonia.

Microtina heckeliana CROSSE, Journ. de Conch. 1871, p. 191, t. 6, f. 2.

Easily distinguished from *M. tuberculata* by the flat spire, as well as by the form and color-pattern of the last whorl, which has tremulous or wavy serrate rays of light brown, instead of green as in the other species. (*Crosse.*)

Genus GENA Gray, 1850.

Gena GRAY, Synopsis of the Contents of the British Museum, 42d edition, 1840, p. 151 (no description given nor species mentioned); GRAY, in P. Z. S. 1847, p. 146 (no description, but *Patella lutea* named as a species); GRAY, Guide to the Systematic Distribulion of Mollusca in the British Museum, p. 159, 1857.—*Gena* Gray, A. ADAMS, Monogr. of Stomatellidæ in Proc. Zool. Soc. 1850, p. 37; Ann. Mag. Nat. Hist. vii, p. 223, 1851; and of subsequent authors. —*Stomatella* and *Stomatia* in part of early authors.

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Gena and other of J. E. Gray's genera purporting to date from "Syn. Brit. Mus. 1840," were not really described in that publication, which is merely a popular account of the contents of the British Museum. The genera of Mollusks are enumerated on pages 150–156, but without author's names, and without even a species mentioned as an example; nor are the new names distinguished in any way from the old. Adams first characterized the genus in 1850; and this may be considered the actual date of publication. The genus differs from *Stomatella* and *Stomatia* in having no operculum, and in the less spiral shell, with larger body-whorl and finer sculpture. The observations upon the animal show great differences among the few species examined, which will probably require the dismemberment of the genus when more species are known anatomically. The dentition has not been well figured. The animals of *G. planulata* Lam. and *nigra* Q. & G. have a large foot, not capable of retraction under the shell; the muzzle is squarish, as in *Trochus;* tentacles subulate, eyes on short peduncles; there is a pair of arborescent frontal palmettes, and the epipodium bears no lateral filaments. G. *lævis* Pse. has a more lengthened form of muzzle; there are siphons or conduits for the entrance and egress of water, and ciliated filaments on the epipodial line (see description of animal under that species, and pl. 55, fig. 16). To the last-named species Fischer has given the name *Plocamotis.*

The *shells* are separable by slight but apparently constant features into two sections; but it remains to be seen whether their characters are correlated with those of the soft parts.

Subgenera.

GENA, s. s. Shell with the body-whorl all over finely spirally striated. Animal without epipodial cirri or lengthened cervical water conduits. Type, *G. planulata* Lam.

PLOCAMOTIS Fischer. Shell with polished body-whorl, the penultimate whorl and base finely spirally striated. Animal with epipodial cirri and cervical water conduits. Type, *G. lævis* Pse.

NOTE.—The measurements of length and breadth are taken parallel to the plane of the peristome. The length is measured along the line *a, b* in fig. 20, pl. 2; and the breadth along the line *c, d.*

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Subgenus GENA s. str.

G. PLANULATA Lamarck. Pl. 55, figs. 1, 2, 3; pl. 2, figs. 17–20.

Shell much flattened, oval, the spire very minute, and very near the end; aperture almost as long as shell, its margins level, not arched.

Oval-oblong in contour, the two sides about equally curved; much flattened, like a *Navicella*. Surface shining, very densely and minutely striate in the direction of the whorls. Color, very deep blackish-olive with white dots, or finely variegated and marbled all over with gray and olive-brown; under a lens seen to be finely articulated on the striæ. Whorls 3, spire minute, not projecting beyond the general ontline of shell. Aperture very large, oval, the columellar and lip margins equally curved, upper end rounded, a pearly callus filling the angle; interior nacreous, with blue-green and fiery-red reflections. Length 19, breadth 10 mill.; aperture, length 16½, breadth 9 mill. Length 17, breadth 10 mill.; aperture, length 15, breadth 9 mill.

Philippines; Australia.

Stomatella planulata LAMARCK, Anim. s. Vert., ed. Desh. ix, p. 17.—Encyc. Méth., t. 458, f. 4.—*Gena planulata* Lam., AD. in Thes. Conch. ii, p. 829, t. 173, f. 1–3.

This species is more depressed and flattened than any other. The spire is very minute. The aperture is not angulated posteriorly, but rounded by a callus which fills the angle.

G. NIGRA Quoy & Gaimard. Pl. 51, figs. 20, 21.

Shell elongate-oval, convex, smooth, black; right margin longitudinally striate, violaceous shining within; spire minute, subterminal; aperture oval, entire.

A very elongated little species, contracted, convex, arched so as to rest upon the extremities alone; the spire is short, nearly terminal on the right margin, composed of 4 whorls. The right margin has six or seven longitudinal striæ, the others, parabolic behind and in front, are incremental. This shell is shining black above, with violaceous nacre within the entire oval aperture. (*Q. & G.*)

Tonga-Taboo.

Stomatella nigra Q. & G., Voy. de l'Astrolabe, Zool. iii, p. 307, t. 66, f. 10–12, 1834.

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Known to me only by the above translated description and the original figures. Adams identified this species with one I believe to be entirely different.

G. STRIGOSA A. Adams. Pl. 55, figs. 31, 32; pl. 2, figs. 8–16.

Shell depressed, Haliotis-shaped, oval, the right side straightened, the left strongly curved; aperture angled above, narrower than the shell, its margins arched, so that when placed on a plane the shell is supported by its extremities. Surface very densely and finely spirally striated all over, these fine, even striæ decussated by oblique growth-lines; color various.

The spire is very short, consisting of a minute projecting cone of about 3½–4 whorls; it is decidedly more elevated and more remote from the margin than in *G. planulata*, and the body of the shell is more convex than in that species. The surface is shining, very finely, closely striated. The color is excessively variable, but in all the mutations there is a white tract along the columella with, usually, a series of red flammules bordering it. The aperture is not bilaterally symmetrical as in *G. planulata*, but angled at the termination of the straightened outer lip, the columella very much arched. The interior is nacreous, its reflections chiefly silvery and green, but sometimes as fiery red as in *G. planulata*.

Length 18, breadth 10½ mill.; convexity when resting on a plane, 5 mill; aperture, length 14½, breadth 8½ mill.

Length 16, breadth 9 mill.; convexity 4¾ mill.; aperture, length 12½, breadth 7 mill.

Port Jackson, Australia.

G. strigosa AD., P. Z. S. 1850, p. 37; Thes. Conch. ii, p. 830, t. 173, f. 11, 12.—*G. nigra* AD., Thes. Conch., p. 829, f. 14–16 (not of Quoy and Gaim.).—*G. plumbea* AD., P. Z. S. 1850, p. 37; Thes. Conch., f. 13.

The species of *Gena* are difficult to distinguish without fuller descriptions or better figures than those in the *Thesaurus*, though the latter are good. Under the head of *strigosa* I have here grouped shells agreeing with Adams' *strigosa*, *nigra*, and *plumbea*. These three seem to represent merely extreme color-patterns in a species so variable that scarcely two of the twenty specimens before me are alike.

The typical STRIGOSA (pl. 55, f. 31, 32) is "rather depressed, the back equally convex, striated all over, olivaceous varied with white

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and lilac, marked with alternate light and dark bands, the light bands sometimes articulated; spire depressed, outer lip slightly sinuous."

The *G. nigra* of Adams (but surely not *nigra* Quoy!), is figured on pl. 55, figs. 5, 6, 7, and pl. 2, figs. 11, 12, 13. It is of a dark olive-brown variously banded and maculated with pink or grayish-white, or suffused with pink under the brown, or unicolored olive-brown (pl. 2, figs. 8, 9, 10), and this last coloration seems to be *G. plumbea* of Adams (pl. 55, fig. 4). Some specimens before me have no brown markings, but are very light, with pink spiral, articulated bands; others are closely painted with green arrow-shaped articulations. In all, the outer lip is a little sinuous.

G. STRIATULA A. Adams. Pl. 55, figs. 34, 35.

Shell haliotis-shaped, ovate-oblong, rather flattened on the back, striated all over, the striæ deep and rather wide apart; red, varied with orange, yellow, and brown; spire prominent, sometimes rather distorted; outer lip strongly flexuous. (*Ad.*)

Calapan, Mindoro, Philippines, 9 fms.; *Australia.*

G. striatula AD., P. Z. S. 1850, p. 37; Thes. Conch. ii, p. 829, t. 173, f. 9, 10.

Has more strongly flexuous outer lip than *G. strigosa.*

G. DILECTA Gould. Pl. 55, fig. 33.

Shell small, thin, lengthened oval, shining, yellowish-green, ornamented with white triangular spots with dark apices, sometimes in series; decussated by incremental and deeper spiral striæ; whorls 3, apex nearly terminal; aperture narrow, oval, the ventral face nearly level; inside shining, greenish. Very delicate and slender, allied to *G. planulata*, a much larger species, and *G. strigosa*, of which it may possibly be the young. Length 8, breadth 4 mill. (*Gld.*)

Hakodadi Bay, Japan.

G. dilecta GOULD, Proc. Bost. Soc. N. H. vii, p. 44, 1859.—SOWERBY in Conch. Icon., f. 14.

Subgenus PLOCAMOTIS Fischer.

Plocamotis FISCHER, Manuel de Conchyliologie, p. 840, 1885. Type, *G. lævis* Pse.

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G. LÆVIS Pease. Pl. 55, figs. 15, 16 (enlarged).

Shell oblong, flatly depressed on its upper side, rounded on its lower edge, smooth, solid, marked transversely by striæ of growth; outer lip straight, inner lip thickened on its edge; aperture oblong oval; spire posterior, small, slightly elevated; greenish-olive, variously spotted or mottled with white, brown or red, sometimes wholly of a dark green color. Length 11, diam. 6½ mill. (*Pse.*)

Tahiti.

Gena lævis PSE., Amer. Journ. Conch. iii, p. 283, t. 23, f. 7, 28, 29 (1867).

This is a depressed form, polished save for close, fine spiral striæ on the penultimate and beginning of the body-whorl, which are continued around the base as in other smooth *Gena*. The spire has a faint keel sketched around the shoulder. The outer lip is somewhat sinuous. The shell is supported by the extremities when standing upon a plane.

Length 9½, breadth 5½ mill.; convexity 2½ mill.; aperture, length 8, breadth 4–9 mill.

The animal lives in the upper region of the laminarian zone, on branched coral, but is usually found under loose stones, on mud or sandy bottom, at low water-mark. The color above is similar to that of the shell, of an olivaceous or brownish-olive, reticulately veined with dusky, lomocotive disc and tentacular appendages pale. The first is large and cannot be wholly retracted beneath the shell; it is oblong rounded behind, thick and fleshy, ciliated around the margin, and slightly tuberculated on the posterior upper portion. When expanded, three hirsute cylindrical tapering cirri project from each side of the shell, which are attached to the upper surface of the foot, and at the outer base of each is a minute aborescent appendage. The mantle is margined with a single series of pinnate cirri, which, when the animal is in motion, are recumbent on the margin of the shell. Head proboscidiform, well developed, lips wrinkled, mouth elliptical. Tentacles very long, tapering and hirsute. Two aborescent appendages in front of the tentacles. Eyes on hirsute pedicels at the hinder base of the tentacles. A siphon projects on each side of the neck, the left incurrent, and the right excurrent (*Garrett* in *Pease*, loc. cit.).

G. ROSACEA Pease. Pl. 55, fig. 12.

Shell oblong oval, convex, somewhat depressed on upper side near the apex, rather thin, concentrically distantly and elevately striate,

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transversely very minutely striate; outer lip straight; spire posterior, whorls angulated, slightly elevated; variously mottled with pink and white; concentric striæ red, spire yellowish or white.

Length 6½, diam. 4 mill. (*Pse.*)

Paumotus.

G. rosacea Pse., Amer. Journ. Conch. iii, p. 284, t. 24, f. 1.

This is very similar to the last species. The close, fine, spirals of the penultimate whorl become nearly obsolete on the last, except on the base. The coloration consists of close fine V-shaped reticulations on a lighter ground, but sometimes is pinky-cream, unicolored, or dark reddish, like *G. caledonica*, with radiating zigzags of white.

Length 10½, breadth 6 mill.; convexity 2½ mill.; aperture, length 8¾, breadth 5 mill.

G. nebulosa A. Adams. Pl. 55, fig. 13.

Shell haliotoid, ovate-oblong, the back all over striated; white, clouded with reddish-brown; spire somewhat prominent, whorls angular; aperture elongate, oval; columella covering the umbilical fissure with a thick callus. (*Ad.*)

Australia.

G. nebulosa Ad., P. Z. S. 1850, p. 38; Thes. Conch. ii, p. 830, t. 173, f. 23.

This is, I believe, a decidedly young specimen of a species immediately allied to *G. lævis* and *rosacea* of Pease.

G. caledonica Crosse. Pl. 55, figs. 10, 11.

Shell imperforate, depressed ovate, thin, slightly shining, under a lens showing scarcely conspicuous transverse impressed striæ, somewhat decussated by very delicate lines of increment, roseous-brown, apex varied with white; spire scarcely prominent, apex rounded; sutures linear; whorls 3, rather convex, the last large, elongated, the base somewhat concave; aperture subovate, striatulate inside, lined with a thin layer of nacre; peristome slightly thickened, margins joined by a white callus, columellar and basal rather thick, scarcely pearly, white, the outer subreflexed, acute, pearly.

Diam. maj. 6, min. 3½, alt. 1½ mill. (*Crosse.*)

New Caledonia.

Gena caledonica Crosse, Journ. de Conchyl. 1871, p. 330; *l. c.* 1872, t. 13, f. 4.

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Specimens of this species before me are deep claret colored, with a few white dots and white flames on the spire; spiral striæ are obsolete except on the base; the incremental striæ are regular, and quite prominent under a lens. The spire is perhaps more elevated than in either *G. lævis* or *G. rosacea* and it shows no trace of the keel sketched around at the shoulder in those two species, the outer lip is straight.

Length 10½, breadth 5½ mill.; convexity 3 mill.; aperture, length 9, breadth 4¾ mill.

✓ G. AURICULA Lamarck. Pl. 2, figs. 21, 22, 23.

Shell of an elongated, rather narrow Haliotis-shape, smooth, polished, except for growth-lines near the lip; body-whorl not spirally striate; color golden, finely reticulated with light golden-brown, and showing several broad and narrow spiral crimson bands.

The outline is long, with sides more parallel than in G. strigosa; It further differs from that form and its allies in the polished surface, without spiral striæ except on the penultimate and beginning of the last whorl, where fine, scarcely impressed, close spiral lines can be seen under a strong lens; a few separated impressed striæ extend along the columellar margin of the base; the upper surface has subregular radiating striæ. The ground color consists of a fine zigzagged mottling of whitish and light brown, through which the underlying nacre shines with a golden iridescence. There are several narrow spiral lines articulated remotely with white dots; and on the latter part of the whorl these are replaced by bands or lines of crimson. The aperture is oblong, the posterior angle filled by a pearly callus; outer lip sinuous; there is a slightly projecting angle where the columella joins the basal lip.

Length 18, breadth 9 mill; convexity when lying upon a plane, 4½ mill.; aperture, length 15⅜, breadth 7⅜ mill.

East Indies; Hong Kong.

Stomatella auricula LAM., An. s. Vert., ed. Desh. ix, p. 17.—Encycl. Méth., t. 450, f. 1.

I have been unable to see that this species is the same as that identified by Adams with *lutea* Linn. I have therefore taken the figure in the Encyclopedie Méthodique as a type, and have described and figured a shell closely resembling it. As in all *Gena* the coloration will doubtless prove to be variable within wide limits. I have therefore described in detail that of the individual figured. Form and striation are the only reliable characters in this group. The

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columellar margin is slightly bowed or concave; the lip margin is not bowed, but in one plane; so that when lying on its face the peristome is in contact with a plane surface all the way around except the median part of the columellar lip; whilst in other polished species the extremities alone support it, both lips being bowed.

G. LENTRICULA A. Adams. Pl. 55, fig. 14.

Shell haliotoid, oblong, back convex, all over very delicately striated, thin, fragile, flesh-colored, spotted with red; spire nearly terminal, small, laterally inclined; aperture open, very much lengthened. (*Ad.*)

Calapan, Island of Mindoro, Philippines; in 9 fms.

G. lentricula AD., P. Z. S. 1850, p. 38; Thes. Conch. ii, p. 830, t. 173, f. 22.

G. LUTEA (Linn.) Adams. Pl. 2, figs. 29, 30, 31; pl. 55, figs. 8, 9.

Shell Haliotis-shaped, quite convex, variegated white and pinkish-brown; surface polished; outer lip sinuous; shell resting on the two ends only when placed upon a plane.

In shape it is shorter than *G. auricula*, with the outer lip more sinuous and more bowed. Surface polished, showing radiating growth-striæ above, under a lens, and close microscopic spiral striæ on the base, the beginning of the last, and the earlier whorls. The color is a brownish pink, mottled and lineolate throughout with white. Aperture oblong, silvery within and iridescent; outer lip sinuous, columella arcuate.

Length 13½, breadth 8, convexity 4½ mill.; aperture, length 11, breadth 7 mill.

East Indies.

Gena lutea Linn. A. ADAMS, in Thes. Conch. ii, p. 828, t. 173, f. 4, 5. (? *Patella lutea* Linn., Syst. Nat. x, p. 783.)

I can but agree with Hanley that the *Patella lutea* of Linné is unidentifiable. The shell described above, and figured on pl. 2, figs. 29–31, is, I believe, the *G. lutea* of Adams. It is a less lengthened species than *G. auricula*, and the lips are so curved that the shell is supported by the ends alone when placed face down upon a plane. It is much more convex than *G. rosacea, lævis*, or *caledonica*, and does not have the faint shoulder carina of the first two. I do not know what relation exists between this and the next species, for while Adams says it is easily distinguished from that form, he does not tell the differences.

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G. VARIA A. Adams. Pl. 55, figs. 19, 20, 21.

Shell haliotoid, ovate-oblong, polished, back equally convex, left side striated, buff, varied with white and red; spire rather prominent, erect, acuminate.

A pretty little species, usually confounded with *G. lutea*, but easily distinguished when its profile is examined; the dorsum is equally convex and polished, and the spire is rather prominent, erect and acuminated. (*Ad.*)

Calapan, Island of Mindoro; Acapulco; on the sands.

G. varia AD., P. Z. S. 1850, p. 37; Thes. Conch. ii, p. 828, t. 173, f. 6–8.

G. CALLOSA Fischer. Pl. 51, figs. 1, 2, 3.

Shell complanate, ovate, elongated, transversely delicately striate; whorls 2½; apex somewhat prominent; aperture oblong, ear-shaped, right lip simple, somewhat excavated in the middle; columella margined, strong, thickened, callous and provided with a tooth-like tubercle; margins continuous, joined by a callus.

Length 11, breadth 7 mill. (*Fischer.*)

Suez.

SAVIGNY, Descript. de l'Égypte, t. v, f. 10.—*Gena callosa* FISCHER, Journ. de Conchyl. 1871, p. 218.

* * *

G. ORNATA A. Adams. Pl. 55, figs. 29, 30.

Shell subturbinate, oval, smooth, polished; reddish-brown, ornamented with longitudinal black lines articulated with white; back convex; spire rather prominent, rosy; aperture oval, columella arcuate, simple; outer lip reflexed, posteriorly subflexuous. (*Ad.*)

Ticao, Philippines, on the reefs.

G. ornata A. AD., P. Z. S. 1850, p. 38; Thes. Conch. ii, p. 831, t. 173, f. 24, 25.

This and the next species are more spiral than other species of *Gena*. They may belong elsewhere.

G. LINEATA A. Adams. Pl. 55, figs. 17, 18.

Shell subturbinate, solid, smooth, polished, convex, pink, with longitudinal red lines; spire rather prominent, whorls rounded; aperture subrotund; columella planulate, callous, rather flattened; lip simple. (*Ad.*)

Habitat unknown.

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G. lineata AD., P. Z. S. 1850, p. 39; Thes. Conch. ii, p. 830, t. 173, f. 26, 27.

Genus BRODERIPIA Gray, 1847.

Broderipia GRAY, Proc. Zool. Soc. Lond. 1847, p. 146. Type, *Scutella rosea* Brod.—*Scutella* BRODERIP, in part, P. Z. S. 1834, p. 48, not *Scutella* Lamarck.

The animal of *Broderipia* is unknown. The species may be divided into two sections. I, species with the apex decidedly recurved, nearer the posterior margin than to the center, includes *rosea, iridescens, subiridescens, cumingii.* II, species with more conical, limpet-like form, the apex nearer the middle than the edge, *nitidissima, eximia.*

B. IRIDESCENS Broderip. Pl. 1, figs. 5–8; pl. 2, figs. 41, 42.

Shell limpet-shaped, with oval outline and posterier apex, the margins expanded; in profile it is very depressed, highest a little back of the middle, the slope from apex upward short and concave, from apex downward gently convex. Surface lusterless, with scarcely visible growth-striæ; opaque-white, radiately striped with olive-bordered red lines, generally interrupted and forming a tessellated white and dark pattern. The apex is minute, recumbent, spiral, dextral. Inside brilliantly iridescent, not showing the color-pattern clearly except at the red-and-white spotted margins.

Length 8, breadth 5½, convexity 1¾ mill.

Grimwood's Island, S. Pacific; Is. of Reunion.

Scutella iridescens BROD., P. Z. S. 1834, p. 48.—*Broderipia iridescens* Brod., ADAMS, P. Z. S. 1850, p. 39; Thes. Conch. ii, p. 832, t. 173, f. 32, 33.—DESHAYES, Cat. Moll. de l'Ile de la Réunion, p. 69.

Beautifully iridescent inside, and more depressed than the following forms. It is quoted by Deshayes from Réunion, on the west side of the Indian Ocean—giving the form a very wide distribution.

B. SUBIRIDESCENS Pilsbry, Pl. 1, figs. 1, 2, 3, 4.

Shell limpet-shaped; outline oval; apex nearly attaining the posterior margin; in profile the posterior slope is very short, concave; the anterior long and convex; it is highest near the apex. Surface nearly smooth, concentric growth-lines microscopic; white, covered with a netted pattern of dots connected by lines of red. Apex

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minute, recumbent, spiral, dextral, the tip eroded. Inside scarcely nacreous, the color-pattern showing through.

Length 6, breadth 4, convexity 1·6 mill.

Habitat unknown.

This is a shell smaller than B. iridescens, and more convex; the apex is nearer the posterior margin; the interior is scarcely pearly. The coloration and lack of granulation distinguish it from *B. cumingi* Ad.

B. CUMINGII A. Adams. Pl. 2, figs. 43–44.

Shell ovate, depressed-convex, subpellucid, pallid, painted with red rays, concentrically corrugated-striate, striæ granulose; vertex posterior, excentric, submarginal; aperture patulous, pearly within, the margin acutely angular, prominent. posteriorly rather straightened. Granulated on the upper surface; the columellar margin is also prominent and angulated. (*Ad.*)

Capul, Philippines.

B. cumingi AD., P. Z. S. 1850, p. 39; Thes. Conch. ii, p. 832, t. 173, f. 34, 35.—SOWERBY in Conch. Icon., f. 2.

Sowerby says that the shell from which the original figures were drawn has been lost but an inferior specimen remains.

B. ROSEA Broderip. Pl. 2, figs. 24–28.

Shell limpet-like, but with a recurved beak projecting beyond the posterior outline of aperture; very convex, sloping convexly toward the front margin. Surface lusterless, showing under a lens rather rude concentric growth-lines, and very numerous, close, fine striæ radiating from apex to margins. The coloration consists of narrow red stripes obliquely descending from the median line to the borders, forming a series of V-shaped markings. The beak is rolled forward and a trifle inclined laterally, but the (dextral) apical whorl is lost. The aperture is oval, posterior margin scarcely expanded; its cavity is deep, scarcely perceptibly nacreous.

Length 4½, breadth 2½, convexity 2·1 mill.; length of aperture 3¾ mill.

Grimwood's Island, S. Pacific; Ceylon.

Scutella rosea BROD., P. Z. S. 1834, p. 48.—*Broderipia rosea* GRAY.—*B. rosea* Brod., ADAMS, P. Z. S. 1850, p. 39; Thes. Conch. ii, p. 832, t. 173, f. 30, 31.—SOWERBY, in Conch. Icon., f. 1.

The shell described above and figured on pl. 2, figs. 24, 25, 26, seems to me to represent this species. Arthur Adams has wrongly referred

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to it in his Monograph in the Thesaurus, having transposed the figures with those of *B. cumingi*. I suppose Sowerby to be correct in his figures. The measurements of my specimen correspond with those given by Broderip. It may be noted, however, that that author's measurements of *B. iridescens* show it to have been more convex than the specimen of that species before me. Nevill has recorded *B. rosea* from South Ceylon.

B. NITIDISSIMA Deshayes. Pl. 1, figs. 15, 16.

Shell patella-shaped, ovate-oblong, symmetrical; apex subcentral; radiately ribbed, the ribs strong, convex, simple, whitish, the interstices irregularly marbled with brown; interior vividly pearly, with a rather large central spot of dull white notched in front, and bounded by the whitish muscle-impression. The rest of the inside has a nacre of unequaled brilliancy with opalescent reflections. The largest specimen measures: length 9, breadth 7, alt. 3 mill. (*Deshayes.*)

Island of Réunion.

B. nitidissima DESH., Moll. de l'Ile de la Réunion, p. 69, t. 6, f 20–22, 1863.—SOWERBY, in Conch. Icon. xix, f. 3.

B. EXIMIA Nevill. Pl. 1, figs. 9–11; pl. 2, figs. 38–40.

Shell patella-shaped, oblong-oval in outline, elevated, with the apex a little above the middle, and a little curved upward; the profile from apex to posterior margin is straight or a little concave, from apex to anterior end it is a little convex. Surface radiately ribbed, with shorter riblets inserted between the principal ones toward the periphery; whitish, more or less marbled with blackish-brown. Interior with a small central opaque white callous, the rest brilliantly pearly, opalescent.

Length 9, breadth 6½, alt. 4 mill.; length 10, breadth 7, alt. 4½ mill.

Southern Ceylon.

B. eximia G. & H. NEVILL, Journ. Asiat. Soc. Bengal, xxxviii, pt. 2, p. 69, t. 13, f. 7, 1869.

Description and figures 9–11 of plate 1 are drawn from a specimen from the authors. The species seems to be very closely allied to *B. nitidissima* but has less strongly developed riblets, is more elevated, and the central white callus of the interior is smaller.

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Family SCISSURELLIDÆ.

Shell minute, unicolored, umbilicated, turbinate or depressed, few-whorled, thin, with a thin layer of pearl inside; aperture oval, outer superior lip with a foramen or slit as in Pleurotomaria, and with a differently sculptured band or anal fasciole encircling the whorls Operculum circular, corneous, thin, multispiral, with central nucleus.

Animal with a rather long rostrum, long, ciliated tentacles, the eyes at their outer bases; foot rather narrow; epipodium bearing 4 ciliated cirri on each side. Radula as in Trochidæ; tooth formula $\infty \cdot 1\ (4\text{–}1\text{–}4)\ 1 \cdot \infty$. Central and lateral teeth with large expanded basal plates and finely denticulate recurved cusps. Uncini very numerous, narrow, with serrate cusps (pl. 50, fig. 18).

A group of very small shells, most of them living in deep water. The fossil (tertiary) species number about as many as the recent. The shell has a considerable resemblance to that of *Pleurotomaria*, but the dentition and external anatomy of the animal is decidedly nearer *Trochidæ*.

Genus SCISSURELLA d'Orbigny.

Shell with an open anal slit, extending backward from the peristome; slit fasciole extending nearly to the apex. Type, *S. lævigata* Orb.

Genus SCHISOMOPE Jeffreys.

Anal fissure closed, forming a foramen in the outer wall of aperture; slit fasciole shorter, not over 1½ whorls in length. Type, *S. cingulata* Costa.

Genus SCISSURELLA Orbigny, 1823.

Scissurella ORB., Mem. Soc. d'Hist. Nat. de Paris, i, p. 340, 1823. —*Anatomus* H. & A. ADAMS, Genera, i, p. 439 not *Anatomus* Montfort, 1810.—*Schizotrochus* MONTEROSATO, Nom. Gen. e Spec., p. 39, 1884, type, *S. crispata* Flem.

The type of *Scisurella* is *S. lævigata* Orb., not *S. elegans* Orb., which is the *last* species in Orbigny's original monograph. Orbigny mentions a *deep slit*, but not a foramen in the outer lip. There is considerable variation in contour among the species, and this may sometime be utilized to break the genus into sections; meantime, as I do not see any characters of much value, I consider *Schizotrochus* of Monterosato a synomym.

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S. COSTATA d'Orbigny. Pl. 50, fig. 1.

Shell thin, transparent; spire depressed, composed of 4 whorls plane on their upper surfaces, strongly carinated at the periphery, convex below the carina; last whorl very large, widely umbilicated; aperture oblique, subquadrangular; columella simple, arcuate; lip simple, sinuous, with a narrow profound fissure; slit fasciole forming the carina of the whorls, with elevated, lamellar edges, and arcuate growth-lamellæ; umbilicus broad and deep, carinated at the border; surface sculptured with arcuate longitudinal riblets, widely spaced and a little undulating, and fine spiral striæ; color white.

Alt. 1, diam. 1⅓ mill.

Mediterranean and Adriatic Seas; Madeira; Teneriffe, Canaries.

S. costata ORB., Mem. Soc. Hist. Nat. Paris i, p. 340, t. 23, f. 2, 1823.—CHENU, Manuel, f. 2716.—WEINKAUFF, Conchyl. des Mittelm. ii, p. 385.—DE FOLIN, Les Fonds de la Mer i, p. 266.—JEFFREYS, Proc. Zool. 1883, p. 89.—MONTEROSATO, Nom. Gen. e Spec., p. 39.—BUQ., DAUTZ., and DOLLF., Moll. du Rouss., p. 430, t. 51, f. 8–11.—*S. lævigata* ORB., loc. cit. supra, p. 340, t. 23, f. 1.—*Argonanta uniumbilicatus* O. G. COSTA, Test. e Crust. Micros., t. 10, f. 1, 1828.—*S. plicata* PHIL., Enum. Moll. Sicil. i, p. 187; ii, p. 159, t. 25, f. 18.—*S. d'Orbignyi* SCACCHI, Catal. Conch. Reg. Neap., p. 16, 1836.—*Padollus orbignyi* O. G. COSTA, Catal. Taranto, p. 51, 1839.—*Delphinula calcaroides* CANTRAINE, Bull. Acad. Bruxelles ix, p. 341, 1842.—*S. cancellata* JEFFREYS, Piedm. Coast, p. 27, f. 1.—*S. affinis* O. G. COSTA, Microd. Medit., p. 60, t. 10, f. 2.—*S. decipiens* COSTA, l. c., p. 60.—*S. striatula* PHIL., Enum. Moll. Sicil. ii, p. 160; Conchyl. Cab., p. 37, t. 6, f. 9.

Var. LÆVIGATA Orb. Pl. 50, fig. 2.

Longitudinal riblets entirely wanting.

The name *lævigata* really has priority of *costata*, and if, as the authors of Mollusques du Roussillon state, the two forms are connected by imperceptible gradations, *lævigata* should be taken as the typical form, of which *costata* is a variety. *In nature*, however, the reverse is doubtless the case.

S. DORBIGNYI Audouin. Vol. XI, pl. 67, figs. 85, 86, 87.

The shell is thin, transparent, glassy, white, ovate, rather depressed, consisting of 3 rather rapidly increasing whorls, and has a very peculiar sculpture; under the rather elevated slit fasciole there are two elevated liræ, and the base has concentric liræ and grooves,

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while the usual growth striæ are not lacking. In the example figured in the Description of Egypt there is a deep groove between the keel and the upper of the two spiral liræ; in the examples observed by me the groove is very shallow, and bears an elevated line. The umbilicus is moderate, the aperture obliquely ovate.

Diam. about 1½ mill. (*Phil.*)

Red Sea.

AUDOUIN's Descript. de l'Egypte, Coq., t. 5, f. 30 (no descript.).—*S. d' Orbignyi* Aud., PHIL., Conchyl. Cab., p. 38, t. 6, f. 10.

S. RETICULATA Philippi. Vol. XI, pl. 67, figs. 49, 50, 51.

The shell is thin, transparent, glassy, white, ovate, rather depressed, but with convex whorls, and consists of 3½ pretty rapidly increasing whorls. The striæ of growth are cut into a reticulation by impressed transverse lines. The umbilicus is moderate, showing none of the whorls; the aperture is obliquely ovate.

Diam. 2 mill. (*Phil.*)

Red Sea.

S. decussata AUDOUIN, Desc. l'Egypte, t. 5, f. 29 (not *S. decussata* Orbigny, a fossil species).—*S. reticulata* PHILIPPI, Conchyl. Cab., p. 38, t. 6, f. 11.

S. KOENENI O. Semper. Pl. 57, figs. 17, 18.

Shell small, fragile, subpellucid, rather narrowly umbilicated, orbicularly depressed; first whorl embryonic; second sculptured, angular, convex below the angle, the anal fasciole situated on the angle very densely encircled with spiral lines, and with remote, inflexed longitudinal lamellæ; anal fasciole a little immersed, its margins lamellose, elevated; aperture rotund, the slit subangulate.

Alt. 1, diam. 1¼ mill. (*Semper.*)

Bohol, Philippines.

S. koeneni SEMPER, Journ. de Conchyl. 1865, p. 286, t. 12, f. 3.

S. HOERNESI O. Semper. Pl. 57, figs. 15, 16.

Shell very small, very fragile, greenish, narrowly umbilicated, orbicular, depressed; first whorl embryonic, smooth; second whorl sculptured; whorls convex, with incurved longitudinal lamellæ and very delicate encircling striæ; median slit-fasciole commencing on the penultimate whorl, simulating a carina, finely striate longitudinally, margins sublamellose; aperture oblique, rotund.

Alt. 1, diam. 1¼ mill. (*Semper.*)

Luzon, Philippines.

The slit-fasciole is not visible on the whorls of the spire.

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S. CRISPATA Fleming. Pl. 58, figs. 22–25.

Shell globose, sloping toward the periphery, delicate, semitransparent, glossy; the sculpture consists of numerous fine, curved, longitudinal ribs, interrupted by the slit fasciole, closer on the base, intersected by minute spiral striæ in the interstices; color pearly white; epidermis thin, caducous, pale yellowish-brown; spire usually rather depressed, but variable; whorls 4, flattened above, rapidly enlarging; slit long and narrow, nearly central; slit fasciole deep, striated across, edges somewhat thick, sharp, prominent; aperture rounded, oblique; peristome continuous; outer lip thin; inner lip folded back on the columella; umbilicus deep, but exposing only the last whorl. Operculum very delicate, with numerous whorls, the last large. Alt. 1, diam. 2 mill.

Spitzbergen to Sicily and Azores, Greenland to New England, 4–790 fms.; *off Culebra, West Indies*, 320 fms.; *Pliocene of Italy and Rhodes.*

Scissurella crispata FLEMING, Mem. Wern. Soc. vi, p. 385, t. 6, f. 3, 1832.—FORBES and HANLEY, Hist. Brit. Moll. ii, p. 544, t. 63, f. 6.—JEFFREYS, Brit. Conch. iii, p. 283.—SARS, Moll. Arct. Norv., p. 126, t. 8, f. 7.—*S. angulata*, LOVEN, Ind. Moll. Scand., p. 20.—*var. paucicostata* JEFFR., Brit. Conch.—*S. aspera* PHIL., Enum. Moll. Sicil. ii, p. 160, t. 25, f. 17; Conchyl. Cab., p. 35, t. 6, f. 6.

Var. ANGULATA Loven. Spire higher; ribs above fewer.

S. UMBILICATA Jeffreys. Pl. 51, figs. 31, 32.

Shell forming a depressed sphere which is equally raised above and below, rather thin, semitransparent and somewhat glossy; sculpture, none except very fine and close set, but indistinct, lines of growth; color white; spire slightly raised; whorls 4–5, flattened above and sloping outwards; they rapidly enlarge, so that the last or body-whorl considerably exceeds in size the rest of the shell; slit long and central, equal in width, with upturned edges; mouth nearly circular, but somewhat angulated where it is united to the body-whorl below the peripheral keel; peristome continuous, although not free in consequence of the inner lip being attached to the shell; outer lip thin and sharp; inner lip spread on the lower part of the body-whorl; umbilicus rather large, funnel-shaped, and deep; operculum not observed, the specimens now described being dead.

Alt. 0·1, diam. 0·1. (*Jeffreys.*)

North Atlantic.

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This differs from any other species known to me in being devoid of sculpture, and in having a conspicuous umbilicus. (*Jeffreys.*)

Scissurella umbilicata JEFFREYS, P. Z. S. 1883, p. 88, t. 19, f. 1.

S. TENUIS Jeffreys.

Shell forming a depressed cone with an expanded base, sloping to the periphery and slit, very thin, scarcely transparent, and rather glossy; sculpture, extremely numerous and fine curved longitudinal striæ, and equally numerous and fine concentric or spiral striæ, which by their intersection cause a regular but minute cancellation; the concentric striæ at the base are stronger and more distinct than the longitudinal striæ; the sculpture is of course interrupted by the peripheral slit and groove; color pearly white; spire greatly depressed; whorls 5, somewhat flattened below the suture; the last enormously exceeds in size all the others put together; slit central, long and broad; groove also broad, marked across by regular but rather distant curved striæ; edges sharp and upturned; mouth obliquely oval; outer lip thin; inner lip folded back and curved; pillar nearly straight, having a twisted fold in front of the umbilicus, which is small and narrow. Alt. 0·25, diam. 0·2. (*Jeffreys.*)

North Atlantic.

This differs from *S. crispata* and its varieties in its depressed shape, thinner texture, more delicate sculpture, the larger size of the last whorl in comparison with the others, the pillar being furnished with a fold, and in its narrower umbilicus. (*Jeffreys.*)

Scissurella tenuis JEFFREYS, Ann. and Mag. Nat. Hist., 4th series, vol. 19, p. 234.

S. CONICA d'Orbigny. Pl. 57, figs. 8, 9.

Shell orbicular-conic, globulose, pellucid, transversely lamellose-ribbed; spire elevated; carina wide; aperture rounded; umbilicus large. Alt. 2 mill. (*Orb.*)

Falkland Is.

S. conica ORB., Voy. dans l'Amer. Mérid., p. 470, t. 78, f. 7–9.—PHILIPPI, Conchyl. Cab., p. 35, t. 6, f. 4.

S. BERTHELOTI d'Orbigny. Pl. 58, fig. 26.

Shell orbicular-depressed, vertex a little flattened, transversely striate-costate above, striate below; spire depressed; whorls 3, rounded; carina broad, acute; aperture orbicular; lip thin, acute; umbilicus open. Slit fasciole smooth; color bistre-brown. (*Orb.*)

Teneriffe, Canaries.

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S. bertheloti ORB., in Webb et Berthelot's Hist. Nat. des Iles Canaries, p. 96, t. 7, f. 2–5.

S. MANTELLI Woodward. Pl. 57, fig. 12.

Scissurella mantelli resembles the type of the genus, S. elegans d'Orb., but is rather larger, more depressed, more strongly ornamented, and has a longer scissural band. The specimen has been in my hands several years, but I did not think it worth publishing until I observed that it exhibited a character hitherto omitted in all descriptions of the genus, viz., that the shell when young has no slit. M. d'Orbigny's figures of *Scissurella elegans*, elaborate and highly magnified, represent the scissural band winding round all the whorls and extending to the extreme apex; but on referring to the specimens collected by Mr. Jeffreys at Spezzia, I found that the band really terminated within half a whorl of the aperture—a smaller proportional distance than in *S. mantelli*, and that during the first part of its life the *S. elegans* also had a simple, entire lip, like the ordinary Trochidæ. (*Woodward.*)

New Zealand.

Scissurella mantelli WOODWARD, P. Z. S. 1859, p. 202, t. 46, f. 8.

Woodward is in error in considering *S. elegans* the type of *Scisurella.*

S. MUNIERI Fischer.

Shell ovate-conic, subelongate, umbilicate; umbilicus moderate, profound; whorls 5, rounded, cancellated, nearly plane above, subconcave; sutures profound; anal fasciole wanting on the earlier 2 whorls, strongly impressed on the following 3, margins expanded, lamellose, especially on the last whorl; fissure moderate; aperture rounded. Alt. 1·66, diam. 1·5 mill. (*Fischer.*)

China Sea.

S. munieri FISCHER, Journ. de Conchyl. 1862, p. 390.

Belongs to the group of *Scissurella* having elevated spires and allied to *S. mantellii* Woodw., *aspera* Phil., etc. (*Fischer.*)

S. SUPRAPLICATA Smith. Pl. 58, figs. 27, 28.

Shell heliciform, spire short, narrowly perforate, thin, semipellucid, white, with a caducous rather thick pale olive epidermis; whorls 3, the first—? (abrupt), second a little convex, somewhat planulate above and radiately arcuately plicate, the last large, having a thin double carina (slit fasciole) a little above the middle, radiately

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arcuately plicate above the carina, below it with striæ of growth; aperture large, irregularly circular, very slightly expanded at the basal margin, peristome continuous, slit narrow, profound.

Alt. 1, diam. 1⅓ mill. (*Smith.*)

Swain's Bay, Kerguelen Id.

S. supraplicata E. A. Smith, Ann. Mag. N. H. xvi, p. 72, 1875; Philosoph. Trans. Roy. Soc. Lond., vol. 168, p. 176, t. 9, f. 5, 1879.

S. alta Watson. Pl. 58, figs. 4, 5.

Shell globose, thin, transparent, strongly sculptured, with a tumid base, a small umbilical chink, a short subscalar spire (on which the old canal slit forms the edge of the successive whorls), and a smallish somewhat prominent rounded tip. Sculpture: Longitudinals frequent, strongish, rounded, curved riblets radiate out from the sutures; they are of much the same strength on the base as above. Spirals—at about one-third of its height from the suture, the last whorl is carinated somewhat feebly by the old canal scar, which is depressed and finely scored across between the narrow slightly projecting lip-edges; on the upper surface a few very obsolete spirals may be seen; the whole base is reticulated by spiral threads, which are closer set, but almost as strong as the radiating riblets. Color white. Spire rather depressed, conical, rising regularly to the extreme tip. Apex round and prominent. Whorls 5, flat and sloping above, carinated; below the carina towards the mouth slightly openly constricted and then tumid on the base. Suture impressed. Mouth round. Outer lip freely curved. Inner lip thin, concave at the base of the pillar, straight, rounded, and very much expanded on the pillar, with an angulated and very patulous junction to the outer lip in front; there is a small umbilical furrow and chink half hidden behind it. (*Watson.*) Alt. ·082 in., diam. ·08.

This species extremely resembles *Scissurella eximia*, Seg. (see Form. Terz., p. 272, pl. 16, fig. 32), both in form and sculpture, but the base is more tumid, the whole shell more compressed, and the apex is a little larger and more exserted. In its strong, radiating ribs it is like *Scissurella staminea* A. Ad., from Japan, but it is much larger and higher. (*Watson.*)

Off Culebra Island, West Indies, in 390 fms.; *off Fayal, Azores*, in 450 fms.

Scissurella alta Watson, Challenger Rep., Gasterop., p. 113, t. 8, f. 1, 1886.

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S. AEDONIA Watson. Pl. 58, figs. 1, 2, 3.

Shell depressedly globose, strongly sculptured, with a rather high scalar spire, exserted whorls, a very sharp and expressed carina, a minute tabulated apex, a strong and impressed suture, a tumid base, and a large pervious but half covered umbilicus. Sculpture: The radiating ribs are pretty strong, sharp, and equal above and below the canal. Spirals—the whole surface is closely sharply, and regularly scored with fine threads, which are a little stronger (but not quite so sharp) on the base than above. Color white. Spire high, scalar, each whorl rising and expanding above the suture. Apex very small and tabulated. Whorls 5; they slope down flatly (barely convex) from the suture, are very sharply carinated at the canal, the under edge of which in particular is prominent and expressed; below the canal they contract into the suture; the base is tumid. Suture strongly impressed and very distinct. Mouth quite round. Outer lip thin, regularly arched. Inner lip on the body thin, and very short, regularly curved throughout, on the pillar-lip.

Alt. ·099 in.; diam. ·09. (*Watson.*)

This species has the strong lamellæ of *lamellata*, A. Ad., from Japan, but these are here still stronger, with a high spire and tumid base. It has some resemblance to Scissurella umbilicata, Jeff., but the spire is much higher, the whorls more exserted and contracted below the canal, and the sculpture is quite different. (*Watson.*)

Off Pernambuco, in 350 fms.; *Nightingale Island, Tristan da Cunha*, 100 to 150 fms.

Scissurella œdonia WATSON, Challenger Rep. Gasterop., p. 114, t. 8, f. 3, 1886.

S. CORONATA Watson. Pl. 58, figs. 11, 12, 13.

Shell obliquely discoidal, strongly ribbed and spiralled, flattened above, with the apex rising like a coronet above the flat upper surface of the whorls, a largish very oblique oval mouth and a large funnel-shaped pervious umbilicus. Sculpture: Longitudinals—above the canal the surface is distantly, radiatingly, and curvedly undulated (like a Haliotis), with minute, sharp, close-set threadlets in the intervals; below the canal there are high, narrow, distant, very curved ribs, which begin feebly below the canal-ridge, and die out at the edge of the umbilicus. Spirals—the old canal rises on a rounded and very prominent ridge, which is perpendicular on the outer and elevated on the inner side; the canal itself is not depressed, but is

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very strongly concavely scored. This ridge lies between the suture and the periphery, rather nearer the latter, and forms a crest to the whorls. Above this ridge the slightly depressed surface is scored with very fine threads, parted by little rounded furrows of about twice their breadth; below the canal edge these spiral threads are stronger, and give a serrated crest to the longitudinal riblets. Spire scalar, but very depressed, the square steps of the whorl edges being very short. Apex small, forming a flat, square-edged coronet, with a slightly depressed minute tip. Whorls 3½ to 4, flat or slightly concave above, highly and squarely keeled by the canal-edge, below which they are very slightly constricted; after this they are tumid to the periphery and on the base. Suture angularly impressed. Mouth narrowly oval, very oblique, largish. Outer lip descending and inflected above, very regularly curved, deeply cut by the fissure, slightly patulous toward the lower outer corner. Inner lip very shortly and thinly appressed on the body between the periphery and the edge of the wide open pervious umbilicus. On the pillar it is barely expanded, is very thin, and runs straight but very obliquely to the point of the base. (*Watson.*) Alt. ·048 in., diam. ·065.

This is one of the most beautiful species of this very beautiful genus. Its sculpture and form are very marked. (*Watson.*)

Tahiti Harbor, near the reefs, in 20 fms.

Scissurella coronata WATSON, Challenger Rep., Gasterop., p. 114, t. 8, f. 4, 1886.

S. DECLINANS Watson. Pl. 58, figs. 6, 7, 8.

Shell square above and tumid below, very delicately, sharply sculptured, with a short scalar spire, a minute tabulated apex, an angulated suture, descending mouth, and a large shallow funnel-shaped carinated umbilicus. Sculpture: On the last whorl there are very fine, sharp, close-set, curved radiating threads, which on the upper whorls are strong riblets; between them the whole surface is finely, closely, microscopically scored with hair-like lines of growth. Spirals—the whole shell is delicately marked with very fine, regular, rather distant threadlets; a little way below the suture and within the periphery is a sharp, narrow keel formed by the upstanding edges of the old canal-ridge. Color dull hyaline. Spire slightly raised, and scalar in very short angular steps. Apex extremely small, tabulated. Whorls 4, of very rapid increase, almost perfectly flat above, keeled by the canal-ridge, below this slightly constricted and then tumid. Suture obtuse angled. Mouth round, small, not

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very oblique; the fissure is very narrow. Outer lip very regularly curved. Inner lip very short and thin on the body, sharp and thin and not much expanded on the pillar. Umbilicus defined by a keel and channelled. Alt. ·044 in., diam. ·063. (*Watson.*)

A small species of great beauty, differing in form of sculpture from *Schismope carinata* Wats., with which it has some relation. (*Watson.*)

Raine Island, Cape York, N. E. Australia, 155 fms.

Scissurella declinans WATSON, Challenger Rep. Gasterop., p. 115, t. 8, f. 2, 1886.

S. OBLIQUA Watson. Pl. 58, figs. 20, 21.

Shell small, depressedly and obliquely globose, rough, and unadorned in any way, with a small, rounded, barely prominent apex, a large, round, very descending mouth and small umbilicus, sculpture none, but some harsh and irregular lines of growth. Color semi-transparent white beneath a yellow epidermis. Spire slightly raised, and more or less subscalar. Apex very small, and the extreme tip is tabulated. Whorls 3½ to 4, of very rapid increase, well rounded, but a little flatter and more sloping above than below; they are scored by the old canal, which lies about half-way between the periphery and the suture, presenting no ridge, but scored across as usual with concave lines. Epidermis yellow, membranaceous, rather thick. Suture slightly openly impressed. Mouth round, but very oblique. Outer lip thin and sharp, shortly but rather widely cleft; a little inflected above, excessively patulous on the base. Inner lip thickened, extremely short, and slightly disunited from the body; very concave on the pillar, where it is bent back so as to cover the umbilical perforation, which presents a narrowed and not pervious but very strong depression. Operculum large, corneous, thin, yellow, with central nucleus and many spiral whorls, which seem to become more numerous toward the margin.

Alt. ·037 in., diam. ·041. (*Watson.*)

This is a very small and unattractive-looking species, entirely destitute of the beautiful sculpture common in the genus. Compared to *S. supraplicata* Smith, from Swains Bay, Kerguelen, this is much smaller, more depressed, more oblique, and unsculptured. (*Watson.*)

Royal Sound, Kerguelen Islands.

Scissurella obliqua WATSON, Challenger Rep., Gasterop., p. 116, t. 8, f. 5, 1886.

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Unfigured species of Scissurella.

ANATOMUS JAPONICUS A. Adams.

Shell trochiform, spire conical; whorls 3½, rather convex, finely decussated by elevated longitudinal striæ and close spiral striæ, the longitudinal striæ flexuous on the base; aperture subcircular; inner lip dilated and reflexed in the middle.

This is a large and very beautiful species, very like *A. crispatus* in sculpture. It also resembles *A. conicus* Orb., but it is more depressed, and instead of being simply striate it is finely decussate; the base of the shell, moreover, is anteriorly produced and angulated. This species and *S. carinata* are met with in greater abundance than the other members of the group, and both occur in deep water. (*Ad.*, in Ann. Mag. N. H. 1862, vol. x, p. 347.)

Mino-Sima, 63 fms.; *Seto-Uchi*; *Gotto*; *O-sima*.

ANATOMUS LAMELLATUS A. Adams.

Shell globose-conoidal; spire conical; whorls 3½, a little convex, cancellated with radiating, subdistant lamellæ, and elevated transverse lines in the interstices; lamellæ flexuous on the base; aperture subcircular; inner lip dilated, angular and broadly reflexed in the middle.

In form this species is most like A. japonicus; but the upper part of the whorls is adorned with fine curved radiating lamellæ, and the inner lip is broadly reflexed, and partly covers the umbilicus. (*Ad. l. c.*, p. 347.)

Mino-Sima, 63 fms.; *Gotto*, 71 fms.; *O-sima*, 26 fms.

ANATOMUS TURBINATUS A. Adams. Shell turbiniform; umbilicus deep, perspective; spire elevated; whorls 4½, a little convex, sculptured with longitudinal, close, radiating lamellæ, angular in the middle, and little, elevated, transverse lines; base ornamented with concentric elevated liræ. This species is elevately turbinate, with two conspicuous carinate whorls and a deep perspective umbilicus. The fine lamellæ of the upper part of the whorls are bent or angulated in the middle. (*Ad.*, l. c., p. 347.)

Mino-Sima, 63 fms.

ANATOMUS CONCINNUS A. Adams. Shell ovate, rather depressed; spire small, scarcely elevated; narrowly, profoundly umbilicated; whorls 2½, convex, decussated by elevated radiating and concentric striæ; aperture oblique, suborbicular. Under the lens this little species seems to be intermediate in character between *A. crispatus*

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Flem., and *A. reticulatus* Phil., the ducussation not being so fine as in the former, nor so coarse as in the latter. (*Ad.*, l. c., p. 348.)

Rifunsiri, Japan, 35 fms.

ANATOMUS MIRIFICUS A. Adams. Shell ovate, depressed; spire plane; broadly and profoundly umbilicated; whorls 2½, rather plane, regularly and elegantly clathrate with elevated radiating and concentric lines; umbilical region nearly smooth; aperture very oblique; inner lip receding.

In this large and beautiful species the entire surface of the whorls is regularly and delicately, finely clathrate, and the umbilicus is very wide and open. (*Ad.*, l. c., p. 348.)

Lo-shan-Kow, Shantung.

ANATOMUS STAMINEUS A. Adams.

Shell ovate, depressed; spire plane; umbilicus moderate; whorls 2½, nearly plane, broadly clathrate with thread-like elevated radiating lines, stronger below the carina, and concentric elevated striæ; umbilical region with elevated concentric lines; aperture rounded-ovate; inner lip receding.

This species is widely clathrate, with conspicuous thread-like radiating and concentric lines, the former of which assume on the spire a lamellar character; the umbilicus is moderate.

(*Ad., l. c.*, p. 348.)

Tsu-Sima, 25 fms.

ANATOMUS DOHRNIANUS Dunker.

Shell globose, very thin, subdiaphanous, concentrically very delicately striate, narrowly umbilicate; whorls 3, carinate; spire small, scalate; slit not very deep, occupying the carina of the whorl; lip thin, acute; aperture oblique, suborbicular, quite elliptical.

Diam. 2½ mill. (*Dkr.*, in Mal. Blät. viii, p. 35, 1861.)

Red Sea.

Genus SCHISOMOPE Jeffreys, 1856.

Schisomope JEFFR., Ann. and Mag. N. H. xvii, p. 321, 1856.—*Woodwardia* CROSSE and FISCHER, Journ. de Conchyl., 1861, p. 160.—*Scissurella* (in part) ORBIGNY, 1823.—*Scissurella* A. ADAMS, Ann. Mag. N. H. 1862, p. 346.—*Anatomus* (in part) H. and A. AD., Genera, p. 439.

Schisomope is a *Scissurella* in which the anal slit becomes closed in the adult, and transformed into an oblong perforation like one of the

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holes of a Haliotis. It bears much the same relation to *Scissurella* that *Trochotoma* does to *Pleurotomaria*. The species inhabit deep water; there are a number of fossil forms described. A. Adams is clearly in error in his use of the name *Scissurella*, instead of *Schisomope*.

S. CINGULATA O. G. Costa. Pl. 57, figs. 1–7.

Shell extremely minute, globose-turbinate, white, fragile, thin; spire very short and obtuse; whorls 3, very convex, rapidly increasing, sculptured with distant elevated radiating lamellæ; the last whorl very large, globose, with longitudinal rather distant lamellæ the interstices decussated by numerous very fine growth lines and spiral lirulæ; anal fasciole commencing on the last whorl opposite the aperture, terminating in a long, narrow slit which does not attain the edge of the peristome, its margins elevated, irregular, lamellar; aperture ovate, narrower above. Alt. ·70 mill.

Mediterranean.

Scisurella cingulata COSTA, Microd. Medit., p. 61, t. 12, f. 8, 9, 1861.—*Schisomope cingulata* Costa, MONTS., Nom. Gen. e Spec., p. 39.—*S. elegans* Orb., of Authors, not of d'Orbigny.

This seems to be the shell called "*S. elegans* Orb." by Woodward and many others; that species however is a fossil *Scissurella*; synonymous with it is *S. striatula* Philippi. The specimen from which my description is drawn has a much longer, narrower foramen than the figures (copied from Woodward) on pl. 57 show.

S. FERRIEZI Crosse. Pl. 22, figs. 43, 44,

Shell umbilicate, turbinate-subdepressed, longitudinally and subobliquely striatulate, yellowish-white; spire short, obtuse; whorls 3–3½, the first 1½ smooth, separated by simple sutures, the remaining whorls rather plane, lamellosely bicarinate above the middle, channelled between the carinæ, the last whorl subdescending, a little constricted just below the carina, then inflated, convex; the groove terminates a short distance behind the lip in an oblong foramen, which does not attain the edge of the lip, a smooth space intervening. Aperture ovate-rounded; peristome simple, thin, acute, subcontinuous. Alt. 1½, diam. 2¼ mill. (*Crosse.*)

Noumea, New Caledonia.

S. ferriezi CROSSE, Journ. de Conchyl. 1867, p. 318, t. 11, f. 7.

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S. MORLETI Crosse. Pl. 22, figs. 37, 38, 39.

Shell broadly and profoundly umbilicated, turbinate-depressed, transversely strongly cristate-carinate, longitudinally subobliquely striate, except on the carina; thin, rather translucent, dull whitish, unicolored; spire very short, depressed; apex planate; suture linear; whorls 3½, rapidly increasing, subplane, the last descending, large, turbinated, quadricarinate, constricted between the carinæ; first second and third carinæ strong, prominent, the interstices concave, subobliquely striated, the fourth carina, much smaller, basal. Fissure situated in the first carina a short distance from the lip, oblong, scarcely attaining the edge of lip; umbilicus concentrically striate, but smooth within; aperture irregularly subquadrate-ovate; peristome simple, margins joined by a very thin callus; columellar margin thin, filiform, subarcuate; basal and outer margins subacute.

Alt. 1½, diam. 1½ mill. (*Crosse.*)

New Caledonia.

S. morleti CROSSE, Journ. de Conch. 1880, p. 114, t. 4, f. 3.

S. MOUCHEZI Velain. Vol. XI, pl. 57, figs. 18, 19.

Shell thin, fragile, depressed, umbilicate, subcircular, grayish-white; spire composed of 3 rapidly increasing whorls; the first embryonic, nearly smooth; the second strongly transversely ribbed; the third very large, angulated by the slit fasciole; below this the whorl is plane or a little convex, with longitudinal little prominent ribs and spiral striæ; above the fasciole there are riblets or striæ intersected by well-marked close longitudinal ribs; slit-margins well-marked, the foramen closed, oval-pyriform; umbilicus moderately large. Alt. 1, diam. ¾ mill.

Id. of St. Paul, inside the crater, in 30–45 meters.

Schisomope mouchezi VELAIN, Comptes Rendus de l'Acad. des sci., July 24, 1876.—Arch. de Zool. Expér. et Génér. 1877, p. 119, t. 4, f. 7, 8.

A variety is described which differs in being more elevated, more convex above, longitudinal ridges obsolete or nearly so, transverse riblets but slightly indicated on the last whorl.

Alt. 1½–2, diam. ¾–1 mill.

S. TABULATA Watson. Pl. 68, figs. 14, 15, 16.

Shell obliquely discoidal, finely ribbed and spiralled, flattened above, with a very small slightly depressed apex, impressed suture, very large round mouth, large lacuniform umbilicus, and a last

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whorl carinatad in its latter half by the prominent upstanding canal-ridge. Sculpture: Longitudinals—there are fine, sharp, pretty close-set, curved, radiating riblets, which are nearly equal above and below the canal; between these in the furrows there are fine lines. Spirals—fully one-half of the last whorl is keeled by the canal ridge, which forms a crest round the top of the whorl a little within the periphery; its outer edge is slightly overhanging, its inner edge raised a very little, the canal is narrow, and sinks between these two edges; it begins in a small oval and ends in a tumid swelling, in which is a small oval hole, sharp-pointed in front. This hole is not cut in the shell after that has been formed, but is developed along with it, the lines of growth conforming to the foramen. The hole is continued within the shell by prominent lips, and a strong little furrow is carried in the substance of the shell from the hole to the edge of the outer lip. This furrow is marked outside by a very slight ridge, but still more by the interruption of the riblets, which curve sharply back, becoming at the same time very faint. The whole surface is scored and the riblets serrated by sharp, fine, remote threads, between each two of which towards the mouth a weaker similar one appears. Spire quite flat. Apex very small, slightly depressed. Whorls 3 to 3½, of very rapid increase; above they are barely convex, on the base they are tumid. Suture slightly impressed. Mouth large, round, very oblique. Outer lip very descending, flat above, well curved and patulous below; it is continued, as in Lacuna, by a sharp keel, which runs straight up into and encloses the umbilicus, but does not include its outer edge. Inner lip short but strongish and defined on the body; it very patulously overhangs the umbilicus, with a broad rounded furrow between its sharp umbilical edge and its inner rounded border; the sharp umbilical edge runs straight down to join the outer lip on the base, and the inner border runs down within the basal lip, flattening out into a very slight callous. Alt. ·055 in., diam. ·083. (*Watson.*)

Off Culebra Island, West Indies, in 390 fms.

Schismope tabulata, WATSON, Challenger Rep., Gasterop., p. 117, t. 8, f. 7, 1886.

S. LACUNIFORMIS Watson. Pl. 68, figs. 9, 10.

Shell obliquely, flatly globose, very finely striated longitudinally and spirally, with rounded whorls, a very small, slightly raised apex, barely impressed suture, very large gibbously round mouth, large lacuniform umbilicus, and a mere dot of a fissure. Sculpture: the

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whole surface is striated with very fine, slightly raised, distant, very oblique longitudinal threads, and with very similar spiral threads, which are a little finer and closer, but on the upper whorls relatively stronger, these longitudinals and spirals (the latter on the top) cross one another, but not at right angles, and do not form tubercles at their intersections. Spire short, slightly raised. Apex very small, prominent; the first whorl and a half seem to be embryonic, and are very finely, microscopically, reticulately scratched. Whorls 4, of not very rapid increase, convex above, rounded at the periphery, and a little excavated on the base by the large-mouthed umbilicus. Mouth large, very oblique, and round, but a considerable section of the circle is cut off by the irregular and twisted pillar. Outer lip descending, well arched all round; beyond the point of the pillar it sweeps on with a sharp, prominent edge, enclosing the umbilicus, up into which it plunges direct. Inner lip strong and defined, but excessively short and retiring on the body, being cut quite away so as completely to expose the umbilicus, deeply but widely sinuated at the top of the pillar, which is slightly twisted, has an oblique, sharp, rounded, but not at all patulous edge; is bluntly toothed, and slightly truncate at the point, which does not run out to the edge of the outer lip, but dies out gradually just within it. Puncture consists of a single most minute oval pore, which opens in a slight bulge of the exterior a little way back from the lip-edge, and has a very slightly thickened margin inside; from it a slight straight furrow runs forwards along the inner surface of the shell; the surface longitudinals bends sharply backwards at the hole, and a little way before the opening is reached, as if preparation were being made for the formation of the opening before it was accomplished.

Alt. ·053 in., diam. ·078. (*Watson.*)

The peculiarity of the outer lip in its relation to the umbilicus in in this and the preceding species, a feature which often occurs also in the fossil genus (Trochotoma), will probably offer a sub-generic, or even generic distinction, for those who love to multiply our difficulties of nomenclature. (*Watson.*)

Off Culebra Island, West Indies, in 390 fms.

Schismope lacuniformis, WATSON, Challenger Rep., Gasterop., p. 118, t. 8, f. 8, 1886.

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SEP 2 1890

MANUAL

OF

CONCHOLOGY;

STRUCTURAL AND SYSTEMATIC.

WITH ILLUSTRATIONS OF THE SPECIES.

BY GEORGE W. TRYON, JR.
CONTINUATION BY
H. A. PILSBRY,
CONSERVATOR OF THE CONCHOLOGICAL SECTION OF THE ACADEMY OF NATURAL SCIENCES OF PHILADELPHIA.

Part 46 plain

PHILADELPHIA:
Published by Conchological Section,
ACADEMY OF NATURAL SCIENCES,
OF PHILADELPHIA.

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S. CARINATA Watson. Pl. 68, figs. 17, 18, 19.

Shell tumid, but depressed, finely ribbed and strongly keeled, with a flattened but scalar spire, convex whorls, a minute apex, a tumid base, and a large funnel-shaped, shallow, carinated umbilicus Sculpture: there are both above and below sharp, little, distant, curved, radiating riblets, between which the whole surface is exquisitely scratched with microscopic lines. Spirals: there is a strong, rounded, expressed double keel, formed by the two edges of the canal scar, which encircles rather more than the whole of the last whorl (except near the mouth); this canal is sunken and is strongly scored. Above the canal the surface is smooth, but a few microscopic spiral threads exist; below and remote from this canal there are on the base three strong, round to square threads, of which the highest is the strongest, and tends to become flattened and expanded into a great spiral fold of the shell rather than a mere thread; besides these another similar but weaker encircles the umbilicus. Color hyaline, but hardly glossy. Spire slightly exserted, the whorls being flat on their upper surface, and rising roundly from the suture. Apex very small, tabulated. Whorls 4, of very rapid increase, very strongly keeled by the canal-ridge, and angulated by the largest and highest thread; the base is very tumid. Suture rectangular. Mouth oval, very oblique. Outer lip runs in straight lines and angles, but is somewhat curved on the base. Inner lip very thin and very short on the body, extremely retiring, being cut quite away, so as to completely expose the umbilicus, concave on the pillar, where it is sharp edged; in front it is subtruncate and slightly twisted, but passes on into the outer lip-edge at the umbilical carina. Umbilicus large, defined by a keel, shallow. Puncture very long and narrow, blunt and rounded at the upper end, and extending to a long fine point in front; it opens on the top of a swollen ridge; it has no projecting lips on the inner side of the shell, but is produced there in a long narrow furrow.

Alt. ·052 in., diam. ·062. (*Watson.*)

The young of this species, it is almost certain, will be taken some day for a Trochus, and the adolescent for a Scissurella, the great length of the old canal and the open foramen being peculiarly deceptive. In this state, when nearly full grown, it is singularly like *S. costata*, D'Orb., from the Mediterranean, but its sculpture is

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different, the mouth is larger, and the umbilicus is wider and yet more shallow. (*Watson.*)

Port Jackson, Sydney, Australia, in 6–15 fms.; *Raine Island, Cape York, North-Eastern Australia,* in 155 fms.

Schismope carinata WATSON, Challenger Rep., Gasterop., p. 119, t. 8, f. 6, 1886.

S. ATKINSONI Tenison-Woods.

Shell minute, globose-depressed, brown; spire short, low, blunt; whorls 3, rapidly widening, plane above, the last very deeply descending toward the aperture, with a strong keel at the shoulder, occupied by the anal fasciole, and another keel at the periphery, the space between them concave; below this carina there are about 3 rather separated spiral liræ, and around the umbilicus three more; the keels are obsolete for a short distance behind the aperture; growth-striæ fine, scarcely perceptible. Slit fasciole present on the last 1½ whorls, very narrow, its edges pinched up into a strong keel. It terminates about ½ or ¾ of a mill. behind the peristome in a long, narrow slot. Aperture very oblique, ovate, narrowed above; columella slightly arcuate, nearly vertical; umbilicus narrowly perforated, funnel-shaped, smooth inside. Alt. 2¼, diam. 2½ mill.

Tasmania.

Scissurella atkinsoni T.-WOODS, Proc. Roy. Soc. Tasm. 1876, p. 149.

Very like *Scissurella declinans* Watson in outline, except that the superior whorls are not ribbed. On old shells the median carina becomes rounded on the last ¾ whorl, and there are numerous spiral riblets both above and below the slit fasciole; the lines of increment are sometimes quite prominent in the interstices between the spirals.

S. CROSSEI Folin. Vol. XI. Pl. 57, figs. 51.

Shell minute, subturbinate, depressed, subcrystalline, slightly shining; spire short, very obtuse; whorls 4, moderately convex, ribbed, joined by a slightly crenulated suture, the last whorl has a double carina [slit fasciole] for two-thirds of its extent, and is ornamented with narrow, very prominent longitudinal, slightly oblique ribs, which attenuate or nearly disappear at the double carina [or fasciole] which is marked by deeply sinuous riblets, and perforated by an oblong-lanceolate foramen. Between the longitudinal ribs there are subundulating spiral lirulæ decussating them. Base deeply

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umbilicate; aperture large, subcordiform; peristome simple, posteriorly a little angulated and reflexed, continuous.

Alt. ·05, diam. ·09 (*de Folin*).

Saint Vincent, Cape Verde Is.

Trochotoma crossei DE FOL., Les Fonds de la Mer, i, p. 144, t. 22, f. 6, 7.

Unfigured species of Schismope.

SCISSURELLA CARINATA A. Adams. Shell ovate, depressed; spire nearly plane; whorls 2½, plane, the last radiately striate above the carina (more strongly at the sutures), below the carina ornamented with elevated, transverse cinguli; base with elevated concentric lines, the interstices cancellated; aperture oblique; inner lip receding.

This species and the others I have named *Scisurella* have a foramen instead of a fissure, and would be called by some *Schismope* or *Woodwardia*, both of which names I believe to be synonyms of *Scisurella* proper. *S. carinata* has a flattened spire and three prominent keels on the last whorl below the carinate periphery; it most nearly resembles *S. d'orbignyi;* but there are three keels besides the fissural carina. (*Ad.* in Ann. Mag. N. H. 1862, p. 346.)

Okosiri, 35 *fms.; Seto-Uchi*, 16 *fms.; Gotto*, 71 *fms. Japan.*

SCISSURELLA MODESTA A. Adams. Shell ovate, depressed, Stomatelliform, narrowly umbilicated; spire small, scarcely elevated; last whorl concentrically striated above the carina, below the carina longitudinally plicate; base ornamented with spiral lirulæ; aperture very oblique, transversely ovate.

A small simple white species, without keels, striated above the somewhat rounded periphery, and obsoletely plicate below. (*Ad.*, l. c., p. 346.)

Tabu-Sima, 25 fms.

SCISSURELLA MIRANDA A. Adams. Shell ovate, depressed, broadly umbilicated; spire nearly plane; last whorl very delicately striate concentrically above the carina, beneath it ornamented with oblique, subnodose, longitudinal, distant plicæ; base with concentric lines; aperture very oblique, transversely ovate.

In this small but very pretty species the last whorl is nodosely plicate below the fissural keel. (Ad. l. c., p. 346.)

Mino-Sima, 63 fms.

S. BEDDOMEI Petterd. Shell small, turbinately depressed, sordidly-white, dull, thin; whorls 3½, apical flat, sinus conspicuous with

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raised margins; longitudinally plicate, plicæ more prominent at the base; aperture ovate, of moderate size. Alt. 1, diam. ¾ mill. (*Petterd*).

Northwest Coast of Tasmania.

S. beddomei PETTERD, Quart. Journ. Conch. 1884, vol. iv, p. 139.

S. PULCHRA Petterd. Shell thin, white; whorls 4, last with two prominent keels at the periphery and several smaller at the base, longitudinally striate, striæ passing over the keels, giving them a nodose appearance. Alt. 2, diam. 1 mill. (*Petterd.*)

Northwest Coast of Tasmania.

In form not unlike *S. atkinsonii* Tenison-Woods, but very different in ornamentation. It was found in shell sand, and from its light texture is generally more or less broken. This is the fourth species of the genus described from our coasts. (*Petterd.*)

Schismope pulchra PETTERD, Quart. Journ. Conch. 1884, vol. iv, p. 139.

S. TASMANICA Petterd. Shell minute, obliquely globose, perforated, thin, white, somewhat shining; spire scarcely raised, minute; whorls 3½, last much inflated, perforation deep, margined with a prominent ridge which is faintly serrated; obscurely irregularly striate all over; sinus deeply open, the fascia of which forms a deep groove encircling body whorl; aperture rounded, inner lip faintly dilate, labrum thin, acute. Alt. 2, diam. 2 mill. (*Petterd.*)

Blackman's Bay, Tasmania.

The second species discovered here; it may be easily known from the first, *S. atkinsoni* Tenison-Woods, by the smooth globose form and color. I have only collected two specimens in shell sand at the locality given. (*Petterd.*)

Schismope tasmanica PETTERD, Quart. Journ. Conch. 1879, vol. ii, p. 104.

SCISSURELLA RIMULOIDES Carpenter. Shell rapidly enlarging, whitish, very thin; apex concealed; whorls 3, radiately lirate, the liræ subdistant, acute, oblique; umbilicus large; lip sloping, scarcely fissured, but with an aperture formed posteriorly as in *Rimula*, subquadrate, elongate; peristome continuous, oblique.

Alt. ·023, diam. ·03 in.

Only one specimen was found of this beautiful little species, the first known from America. It looks like a Velutina crossed by sharp ribs in the direction of the slanting mouth. In the first whorl

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the ribs are very close. It then assumes its normal sculpture, but there is nearly a whorl before there is any trace of incision. This appears to have begun as a slit, which was afterwards closed up. A band, marked off by ten transverse ribs showing stages of growth, encircles the shell as far as the hole, which is long and somewhat rectangular; but there is no band between the hole and the outer lip. The shell furnishes a complete transition to Rimula. (*P. P. Carpenter.*)

Mazatlan.

Scissurella rimuloides CPR., P. Z. S. 1865, p. 271.

Family *PLEUROTOMARIIDÆ* Dall.

Shell trochoidal, nacreous within, umbilicate or imperforate, having a slit or sinus in the outer superior margin of the peristome, which serves the purpose of an outlet for the anus, and leaves on the corresponding part of the whorls a peculiarly sculptured band, the "anal fasciole" or "slit fasciole."

Animal without frontal lobes or appendages; eyes at the outer bases of the tentacles; muzzle as in Trochidæ; tentacles long, subcylindrical, bluntly pointed. Epipodium broad, thin, entire, fringed with a row of small, short papillæ, but not bearing cirri, closely applied to the shell. Radula long; rhachidian tooth narrow, lanceolate, its tip narrow, recurved; laterals 26, the outer 5 without cusps; the inner ones larger, with wide cusps and narrower bases. Outside of the laterals are 2 rows of uncini, the inner series about 18 in number, large, strongly curved, with scythe-shaped 1–3 denticulate cusps; outer uncini very numerous (40–50), small, very oblique. (*P. quoyana.*) In *P. adansoniana* there are considerable differences in the teeth; some of the uncini bearing little tufts of bristles at their apices. Jaws subobsolete.

Genus PLEUROTOMARIA Sowerby, 1821.

Pleurotomaria J. SOWERBY, Mineral Conchology iii, p. 139, t. 278, Dec. 1821.—*Pleurotomaire* DEFRANCE, Tabl. des. Corps Foss., p. 114, 1824 (no descr.).—*Pleurotomaria Defr.* J. de C. Sowerby, Min. Conch. vii, p. 69, t. 640, Nov. 1844.—CROSSE, Journ. de Conchyl. 1882, p. 1.—FISCHER Manuel de Conchyl., p. 849, 1885.—*Pleurotomaria* Sowb., DALL, Bull. Mus. Comp. Zool. xviii, p. 396.

Dr. Dall has satisfactorily shown that the name *Pleurotomaria* should be attributed to James Sowerby, not to Defrance, who never defined nor latinized his "*Pleurotomaire.*"

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The genus includes several hundred fossil forms, mostly Paleozoic. It is one of the oldest Gasteropod genera, commencing in the Cambrian. There have been published several valuable articles upon the recent species, among them Mr. Crosse's Monograph in the Journal de Conchyliologie for 1882, and Dr. Dall's study of the soft parts of *P. adansoniana* and *quoyana* in the Blake Report, making known for the first time the anatomical structure of this most interesting type. The recent species are four in number. About a dozen specimens are known, in all. They fall into two sections.

Section PEROTROCHUS Fischer, 1885. Form conical; base not umbilicated; whorls striate or granulate. Anal fasciole submedian or below the middle; slit short. (Type *P. quoyana.*)

Section ENTEMNOTROCHUS Fischer, 1885. Shell conoidal, striate, umbilicate; anal fasciole a little above the middle of the upper surface of the last whorl; slit long, but not much exceeding the half of a whorl. (Type *P. adansoniana.*)

Section PEROTROCHUS Fischer.

P. QUOYANA Fischer & Bernardi. Pl. 56, figs. 4, 5, 6.

Shell trochiform, obtusely carinated, with the base rounded, flattened and concave but not umbilicated. Spire turbinate, terminating in an acuminate apex; whorls 9, slowly increasing, rounded and swollen toward the suture, divided into two unequal portions by the slit fasciole, granulose. Slit fasciole below the middle, decussated by semicircular and spiral striæ. Slit quite wide, but short; umbilical depression excavated, nacreous, iridescent, and surrounded by slight concentric grooves. Aperture semioval, nacreous within. Columellar margin recurved with a nacreous callosity; outer lip not reflexed, nearly sharp. Color pale rose, with obscure dashes or flammules of reddish-brown.

Alt. 40–42, diam. 48–50 mill.; width of slit, 2½ mill. Operculum nearly circular, brown, with 10 whorls, 7½ x 7 mill.

Off Barbados, 73 and 84 fms.; *Off Yucatan*, 130 fms. (dead); *Id. of Marie-Galante, near Guadelupe.*

P. quoyana FISCHER & BERNARDI, Journ. de Conchyl. v, p. 165, t. 5, f. 1–3, 1856.—CROSSE, l. c. XXX, p. 14, 1882.—SOWERBY in Reeve's Conch. Icon., f. 2, 1874.—DALL, Report on Blake Gasterop., p. 397, t. 29, f. 1; t. 31, f. 1; t. 37, f. 5.

The smallest of the recent species. The animal is described by Dall, *l. c.* The above description is taken from that of Crosse.

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P. BEYRICHI Hilgendorf. Pl. 56, figs. 7, 8, 9.

Shell trochiform, as high as broad, with flat base, moderately numerous spiral liræ, pale yellow, beautifully flamed with red, whorls 11, regularly increasing, on the penultimate whorl with 8 liræ above, 2 in, and 2 under the slit fasciole; these liræ are beset with weak nodules, about 3 times as long (in the direction of the spiral) as high or broad. The last whorl has a blunt angle at base; base with 20 concentric liræ, and in the middle a deep pit or "false umbilicus," outside white, inside pearly; columellar margin thick, pearly, *S*-shaped. Alt. 82, greater diam. 83, lesser 78 mill.

Japan.

P. beyrichi HILG., in Sitzungsb. d. Gesellsch. Naturf. Freunde Berlin, 1877, p. 72.—MARTENS, Conchol. Mittheil. i, p. 33, t. 7.—CROSSE, Journ. de Conchyl. XXX, p. 16, 1882.

The above description is translated from Von Martens. A single specimen is known. It was discovered by Dr. Hilgendorf in an ancient Japanese collection.

Section ENTEMNOTROCHUS Fischer.

P. RUMPHII Schepman. Pl. 57, figs. 13, 14.

Shell broadly conoid, the base convex, moderately umbilicated, the umbilicus penetrating to the apex, a little plicated within by the prominent growth-lines; color yellowish-white, with flames of orange or carmine red, and light violet, particularly developed on the last whorl; apex eroded and yellow; number of whorls uncertain, probably between 11 and 13. Whorls visibly convex, divided into nearly equal portions by the slit fasciole, which is a little above the middle. The sculpture is composed of oblique, radiating striæ, more prominent on the upper whorls; base almost smooth, with slight striæ of growth and very fine concentric lines. The aperture is obliquely quadrangular, nacreous; basal margin continuous with the columella, not angulated at its junction with it.

Alt. 170, diam. 190 mill.; length of slit, 230 mill., width 2½ mill.

Moluccas.

P. rumphii SCHEPMAN, Tydschr. d. Ned. Dierk. Vereen, iv, p. 163, 1879.—CROSSE, Journal de Conchyl. XXX, p. 8, 1882.—SOWERBY, Thes. Conch. v, p. 185, t. 490, f. 1, 2.

The only specimen known of this largest species of *Pleurotomaria* is in the Zoological Garden of Rotterdam.

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P. ADANSONIANA Crosse & Fischer. Pl. 56, figs. 1, 2, 3.

Shell trochiform above, plano-convex beneath, and concave in the middle, concentrically costate-sulcate, the ribs granulose; broadly and deeply umbilicated, the umbilicus pervious; longitudinally rugulose; color pale yellowish-fleshy, with numerous, irregular, reddish spots, sometimes vivid, sometimes more or less effaced; apex acuminate, smooth, yellowish; whorls 11, slowly increasing, rather planulate at the sutures; unequally divided by the slit fasciole, below it traversed by 7 to 8 spiral granose ribs, above it with longitudinal, oblique, rather separated striæ and two spiral, slightly marked series of granules; last whorl obtusely bicarinate; slit fasciole with semicircular, delicate, impressed striæ. Aperture subquadrate, pearly within. Alt. 74, diam. 80 mill. (*C. & F.*)

Off Barbados, in 69–200 fms.; *Guadelupe*, 150 fms.

P. adansoniana C. & F., Journ. de Conchyl. ix, p. 163, t. 5, f. 1, 2, 1861.—DALL, Bull. M. C. Z. ix, p. 78, 1881.—CROSSE, Journ. de Conchyl. xxii, p. 12, t. 1, f. 1, 2, 1882.—DALL in Agassiz, Three Cruises of the Blake ii, p. 69, f. 288, 1888; and in Rept. Blake Gasterop., p. 400, t. 30, t. 31, f. 3–6, t. 32, f. 10, t. 37, f. 4, 1889.—SOWERBY in Conch. Icon., f. 1, 1874.

Two specimens dredged by the Blake measure as follows:

a. Alt. 130, diam. 130 mill.; length of slit, 200 mill.

b. Alt. 70, diam. 88 mill.; length of slit, 142 mill.

The operculum as described by Dall, measures 54 mill. x 47 mill., is almost flat, with 10 whorls of which the central ones are rather indistinct. The outer surface is minutely sharply spirally striated, and a central spot the size of a pin head is indistinctly indented; the inner side is polished and shows a somewhat egg-shaped scar of attachment; it is of an amber-brown color. The extreme margin is thin and a little frayed. The anatomy and dentition are described and figured by Dall, in the Blake Report.

Family *HALIOTIDÆ.*

Family characters.

Shell nacreous, spiral, the spire small, body-whorl very large and depressed, having a row of round or oval holes along the left side, aperture very large, occupying nearly all of the lower face, columella (properly speaking) absent, the spire being open in the middle, seen from below; but the columellar margin is produced into a

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flattened spiral plate. Muscle-impression horse-shoe shaped, the left branch narrow, inconspicuous, inside the columellar plate, the right branch very large, rounded, situated in the middle of the aperture.

Animal with a fleshy foot, a fleshy epipodial ridge fringed with cirri, a frontal vail connecting the short eye-stalks; the mantle slit along the row of holes, branchial cavity containing a gill on each side of the slit.

The above-defined family constitutes one of the most distinct groups in the *Rhipidoglossa*, most nearly allied probably to the *Pleurotomariidæ*. Of the genealogy of the family little is known. A few fossil forms not differing materally from the recent ones have been discovered in the Pliocene and Miocene, and one in the upper cretaceous of Germany. Others will probably be found when the Australian Tertiary and Secondary strata are more fully explored.

The comparatively slight differences observable among the numerous recent species, and their distribution, seem to point to a rapid and recent development; but the isolation of the group as a whole indicates its considerable antiquity.

The "center of distribution" is in the Australian and adjacent seas. Here are found the greatest number of species and greatest diversity of forms. The largest species inhabit the west coast of North America, but they belong to only two closely allied groups, and probably reached our shores by way of Japan and Alaska. Not one species is found on the east coast of North or South America, and only one, *H. pourtalesii*, on the west coast of the Americas south of Lower California.

The shells are much used for the manufacture of pearl buttons, buckles and inlaying. On the Californian coast "they are captured by Chinese boatmen, who row along near the rocks, when the tide is low, and peer curiously down into all the cracks and clefts where these great creatures hide. When one is discovered, a wedge on the end of a pole is employed to suddenly dislodge the mollusk from his strong-hold, and a boat-hook draws him up from the water into the hands of the enemy." (*Keep*, in the Nautilus iv, p. 14.)

"They are found under stones or in out-of-the-way places among the rocks when the tide is low. All of these mollusks are rock lovers, and it is idle to seek for them except among the crags or broken boulders. It is exceedingly interesting to capture a good-sized fellow and watch his mode of locomotion. When placed on a

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smooth rock he moves along at no snail's pace, but strides on like an elephant. Not quite so fast, to be sure, but the motion of his body, slightly swaying from side to side, and the tremendous muscular force which he evidently exerts cause one to involuntarily compare his gait to that of the great proboscidian."

"Very fine green pearls, almost rivaling the product of the pearl-oyster are sometimes taken from its mantle. Its flesh is good for food, though perhaps few people except Chinese and Indians ever indulge in that luxury. I can speak from experience however, and am ready to affirm that 'abalone soup,' well made, is fit for the table of the most fastidious." (*Keep, l. c.*)

Very young shells have no perforations, just as the young *Scissurella* has no slit.

In California these shells are known as "Abalones," a local name of uncertain etymology. They are called "ormers" in England, where quantities of *H. tuberculata* are manufactured into buttons. French names are "Ormier" and "Silieux" (six yeux, six eyes). The Japanese call them "awabi."

The animal (pl. 1, fig. 17) has a strong fleshy foot as long as the shell (or in *Teinotis* a little longer), its upper surface granose. Head with a short thick proboscis ending distally in a rounded disc, in its center is the mouth, a longitudinally oval orifice; there is a frontal vail, somewhat lobed but not fringed, connecting the short eye-peduncles, which lie just above and outside of the subulate tentacles. A fleshy and prominent epipodial ridge surrounds the foot, its border tuberculate and fringed with short cirri. In front this epipodial ridge terminates just under the tentacles; behind it is interrupted by an oval rugose tract of the integument (the operculigerous lobe) indicating the position of the absent operculum. The mantle is slit at the position of the row of holes, the slit extending as far back as the last open hole, which is occupied by the prolonged free anus. The gills are long, one on each side of the slit, each composed of two series of lamellæ united by a central rachis.

Haliotis has been monographed by REEVE, Conchologia Iconica, vol. iii, 1846. This work contains descriptions of many new species. The descriptions are extremely poor. Reeve did not figure or describe the characters of the interior. His figures of the outside are good.

G. B. SOWERBY Jr. in the Thesaurus Conchyliorum, vol. v, 1882? Contains more species than Reeve's work, being later. The figures are not so good.

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WEINKAUFF in Systematisches Conchylien Cabinet von Martini u. Chemnitz, 2d edit., 1883. Most of the figures are very poor, but the text is superior to the other works. The author had not, however, seen nearly all of the species.

In neither of these works are the species arranged systematically.

Synopsis of Genera and Sections.

Genus HALIOTIS Linné, 1858.

Characters those of the family.

Section HALIOTIS *s. str.*

Shell oval; the foot projecting only a short distance behind it.

Section PADOLLUS Montfort, 1810.

Shell rounded, depressed, having a sulcus parallel to the row of holes.

Section TEINOTIS H. & A. Adams.

Shell very long and narrow, smooth; foot of animal projecting a greater distance behind it than in *Haliotis s. str.*

Genus HALIOTIS Linné, 1758.

Haliotis LINN, Systema Naturæ x, p. 779, 1858 (first species *H. midæ*); and of authors generally.—*Padollus* MONTF., Conch. System ii, p. 114.—*Sulculus* H. & A. ADAMS, Gen. Rec. Moll. i, p. 443.

The principal characters for distinguishing the species are the outline of the shell, which is either equally curved on the two sides or straighter on the right margin; the convexity of the back, which may be carinated or rounded at the row of holes; the sculpture; the position of the spire; the color of the inside; smoothness or roughness of the muscle-scar; width and slope of the columellar-plate; and within rather wide limits the number of open holes.

NOTE.—The measurements are taken as I have directed for the species of *Gena* (see bottom of page 37; and pl. 2, fig. 20). The distance from apex to margin should be measured in a plane parallel to the plane of the peristome, as one would measure it on a figure of the dorsal surface of the shell.

It is convenient to segregate the numerous species of Haliotis into groups; and the following is offered as a preliminary arrangement:

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Group of H. albicans.

Shell almost smooth, having obsolete fine spiral striæ; oval, evenly convex, the two sides equally curved; not carinated at the row of holes; cavity of spire large, not concealed; nacre silvery; muscle-scar not distinct; holes very small, about 12 in number not tubular.

Australia.

Group of H. cracherodii.

Shell smooth or with low obsolete coarse spirals; oval, evenly convex, the two sides equally curved; not carinated at the row of holes; cavity of spire minute, concealed or nearly so; nacre silvery; muscle-scar generally not distinct; holes small, numerous, not tubular, outside black.

California.

Group of H. corrugata.

Shell large, rounded-oval, convex, carinated at the row of holes, with coarse spiral cords outside and often obliquely waved or corrugated; nacre brilliant, muscle-scar distinct, rough (except in *H. gigantea* and *assimilis*); columellar plate wide, sloping inward, nearly concealing the small cavity of the spire. Holes few, tubular, a channel below them.

W. Coast N. America; Japan.

Group of H. tuberculata.

Shell much depressed, long-oval, spirally striated and often with coarse radiating lamellæ; carinated at the holes; cavity of spire small, close to the posterior margin, but visible; nacre silvery; muscle-scar not distinct. Holes slightly raised; columellar plate flat, rather narrow.

Japan and Seas of Europe.

Group of H. stomatiæformis.

Shell small, oval, often much elevated; sculptured with spiral cords and radiating folds or lamellæ; more or less carinated at the row of holes; spire subterminal. Holes five or less, somewhat tubular; columellar shelf wide above, and flat.

Japan to Viti Is. and N. Caledonia.

Group of H. pustulata.

Shell long-oval, right side generally straightened; carinated at the row of holes; surface spirally striated, often pustulated or waved;

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cavity of spire not concealed, but near the posterior end; nacre silvery; muscle-scar not distinct.

Indian Ocean.

Group of H. diversicolor.

Shell oval evenly convex, the two sides equally curved, scarcely carinated at the row of holes; spirally striated; apex very close to the posterior margin.

Japan to Australia.

Group of H. iris.

Shell rather large, oval, convex, carinated at the row of holes; apex subterminal; nacre dark, the muscle scar roughened; cavity of spire minute, concealed; peristome continuous.

New Zealand.

Group of H. rugosoplicata.

Shell oval, light, convex, radiately corrugated above, spirally ribbed below the row of holes; nacre silvery. Holes circular, slightly tubular, 6 to 8 in number.

New Zealand; S. Australia.

Group of H. mariæ.

Shell oval, spire small, subterminal, surface with strong spiral ribs; inside silvery, muscle-scar not distinct; holes 6, circular, a little tubular.

Australia.

Group of H. midæ.

Shell rounded, convex, spire large; nearly smooth or with radiating lamellæ or wrinkles, spiral sculpture wanting or obsolete; muscle-scar distinct or not; young with a blood-red spot inside the spire; a carina at the row of holes.

Cape of Good Hope.

Group of H. nævosa.

Shell rounded, flattened, the spire large; surface having spiral striæ (sometimes obsolete) and usually radiating waves; a carinæ at the row of holes; inside silvery.

New Zealand; Australia.

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Group of H. excavata.

Shell subcircular, very convex, spire subcentral; spirally lirate and radiately folded.

Australia.

Section PADOLLUS Montf.

Group of H. parva.

Upper surface closely spirally striated, having a strong, rounded spiral rib inside the row of holes; with or without radiating lamellæ between that rib and the spire.

Group of H. pulcherrima.

Small; upper surface radiately corrugated, scarcely striated spirally; 7 to 8 holes open.

Group of H. ovina.

Spiral striation obsolete; having coarse radiating folds above, or a spiral row of tubercles; no spiral rib inside the row of holes; perforations 4 to 5.

Group of H. brazieri.

Flattened, with a spiral rib inside the row of holes; surface smooth, without radiating folds or spiral striæ.

Group of H. albicans.

A large oval smooth shell is the following, having obsolete spirals. It probably has no especial relationship to *H. cracherodii*, but shows the same curious parallelism in characters exhibited by a number of New Zealand and Australian shells belonging to various families.

H. ALBICANS Quoy & Gaimard. Pl. 5, fig. 27.

Shell large, oval, distance of apex from margin one-sixth to one-eighth the length of the shell; nearly smooth but with obsolete spiral liræ; orange or orange-scarlet, radiately striped with continuous white flames; perforations very small, about 12 in number.

The outline is oval, right and left margins about equally curved; back convex, rounded, not angulated at the row of perforations. It is rather thin, the coloration consisting of continuous oblique stripes of scarlet and whitish. Surface sculptured with nearly obsolete spiral threads and cords. Spire moderately elevated, whorls about 2½. Inside silvery, the nacre almost smooth, but showing traces of

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spiral sulci, and very minutely wrinkled. Columellar plate rather wide, sloping inward, flattened, obliquely truncated at the base. Cavity of spire large, rather shallow. Perforations unusually small, their borders not raised outside.

Australia.

H. albicans QUOY ET GAIMARD, Voy. de l'Astrolabe iii, p. 311, t. 68, f. 1, 2.—DESH. in LAM., An. s. Vert. ix, p. 31.—REEVE Conch. Icon., f. 30.—PHILIPPI, Abbild. u. Beschreib. ii, t. 4, f. 1*a*, 1*b*.—SOWERBY, Thes. Conch. v, t. 3, f. 20.—WEINKAUFF, Conchyl. Cab., p. 71, t. 28, f. 2.—*H. glabra* SWAINSON, Appendix to Bligh Catal., p. 1, 1822.

Distinct in its smooth rounded form and radiating stripes. All previous monographers have given New Zealand as the habitat of this shell, but Hutton drops the species from his New Zealand list of 1880.

Group of H. cracherodii.

This smooth black species is probably a divergent branch of the group of *H. corrugata.*

H. CRACHERODII Leach. Pl. 10, figs. 52, 53.

Shell oval, convex, spire near the margin; surface almost smooth, but usually showing nearly obsolete spiral liræ. Perforations about 8, color greenish-black or dull purplish-black.

An oval shell with the two sides equally curved, the back regularly convex, not carinated at the row of perforations; outside covered with a thick black layer. Surface smooth, except for spiral liræ which are sometimes wholly obsolete, and lines of growth. Spire low, near the margin. Inside smooth, silvery with red and green reflections; columellar plate not truncate below, sloping inward, its face concave; cavity of spire very small, almost concealed.

Length (of an average specimen) 112, width 85, convexity 30 mill.

Fallarones Is. to San Diego, Cal.

H. cracherodii LEACH, Zool. Misc., p. 131.—REEVE, Conch. Icon., f. 23.—CARPENTER, Report, p. 390.—WEINKAUFF Conchyl. Cab., p. 12, t. 5, f. 1, 2.—*H. glabra* SCHUB. & WAGN. Continuation Conch. Cab. xii, p. 76, f. 3036, 3037 (not *glabra* Chem.).—*H. californiensis* SWAINS., Zool. Illust. ii, t. 80.—REEVE, Conch. Icon., t. 8. f. 26.—CARPENTER, Rep., p. 199, 320.

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A well-known and abundant species, peculiar in its uniform blackish color and numerous small perforations. The muscle attachment is usually smooth, but specimens occur having a small roughened area there. The largest shells I have seen of this species have a length of about 160 mill.

The *H. californiensis* of Swainson is a specimen with more numerous perforations than the type. It can scarcely be separated varietally.

Group of H. corrugata.

These shells are eminently characteristic of the western coast of America, all of the species of that region except *H. cracherodii* grouping here. The group comprises most of the large species of *Haliotis*, and the two largest (*gigantea* and *rufescens*). One species, (*H. gigantea*) exhibiting numerous diverging varieties and forms is found in Japanese waters.

✓H. CORRUGATA Gray. Pl. 5, fig. 24.

Shell large, subcircular or short oval, very convex, like a half-globe; surface corrugated all over, the wrinkles nodose; perforations elevated, tubular, three open; inside dark, very brilliantly iridescent, muscle scar distinct, roughened.

The outline is more rounded than usual, being a very short oval; the back is very convex. The strong epidermis is dull, olive-brown usually having wide oblique greenish intervals; the sculpture begins as crowded spiral cords or liræ, but over the greater part of the body-whorl these become nodose at short intervals, or are crossed by obliquely radiating corrugations. It is angled at the row of holes; below these there is a distinct spiral channel or furrow, bounded below by a more or less distinct row of nodules; and between this and the columellar margin it is obliquely corrugated, the folds scalloping the lower part of the columellar margin. The spire does not project above the general outline of the shell. Inside it is dark, iridescent, red predominating in the coloration. The muscle impression is large, distinct, roughened all over, and like fine mosaic work in its brilliant coloration. The flat or concave columellar plate slopes strongly inward, and is not at all truncate at the base; above it almost conceals the small cavity of the spire. The large tubular perforations are sometimes two, but normally three in number. Length 155, width 122, convexity 57 mill.

San Diego, Cal., southward; Catalina Island.

H. corrugata GRAY in Wood's Index Test. Suppl., t. 8, f. 5.—REEVE Conch. Icon., f. 12.—SOWB. Thes. Conch., t. 4, f. 26 (excl. var.).—WEINKAUFF, Conchyl. Cab., p. 67 t. 25, 26.—KEEP, West

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Coast Shells, p. 94.—*H. nodosa* PHILIPPI, Zeitschr. f. Mal. 1845, p. 149; Abbild. u. Beschreib. ii, p. 69, t. 5, 6, fig. 1.

Distinguished by the corrugated-nodose outer surface, orbicular and strongly convex form, and the deep channel revolving below the row of perforations.

H. FULGENS Phillippi. Pl. 12, figs. 61, 62.

Shell large, oval, quite convex, sculptured all over with equal rounded cords or liræ; of a reddish-brown color. Generally five holes are open.

The form is oval, as in the other American Haliotis, the back quite convex. It is solid, but thinner than *H. rufescens*. The outside is a uniform dull reddish-brown. It is sculptured with rounded spiral liræ, nearly equal in size, 30 to 40 in number on the upper surface. At the row of holes there is an angle, the surface below it sloping almost perpendicularly to the columellar edge, and having an obtuse keel about midway. The spire does not project above the general curve of the back. Inside dark, mostly blue and green with dark coppery stains, pinkish within the spire; the muscle impression painted in a peculiar and brilliant pattern, like a peacock's tail. Columellar plate wide, flat, sloping inward. Cavity of the spire small, almost concealed. Perforations rather small, elevated, circular, about 5 in number.

Length 170, width 130, convexity 48 mill.

Lower California and California, northward to Monterey Bay.

H. fulgens PHIL. Zeitschr. f. Mal. 1845, p. 150; Abbild u. Beschreib. ii, p. 220, t. 7; t. 8, f. 1.—WEINKAUFF, Conchyl. Cab., p. 24, t. 7, 8.—*H. splendens* REEVE, Conch. Icon., f. 9; Proc. Zool. Soc. Lond. 1846, p. 54. And of authors generally.—*H. planilirata* RVE. Conch. Icon., f. 62 (young).

This magnificent shell has long been known under the name of *H. splendens*. Philippi's publication was before Reeve's, as the brothers Adams and Weinkauff have already announced. The restoration of the oldest name becomes therefore simply a matter of justice and necessity.

It is a thinner species than *H. rufescens*, with darker interior and different sculpture. The mingling of tints upon the great muscle-scar is indescribably rich and effective.

The *H. planilirata* of Reeve (pl. 19, fig. 9) is a young shell of this species.

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H. RUFESCENS Swainson. Pl. 20, fig. 11.

Shell large, heavy and solid, oval, not very convex; sculpture consisting of unequal spiral cords and threads and wide low radiating waves; color dull red; holes three or four.

The shell is very large, sometimes attaining a length of 9 inches; it is thick and heavy, covered outside with a thick brick-red layer which projects at the edge of the lip forming a narrow coral-red edge. The spiral cords are unequal in size, and finer than in *H. fulgens;* the waves of the surface are large and oblique. Below the row of holes there is a depression, followed by a low ridge bearing usually large obtuse tubercles. The spire does not project above the general curve of the back. Inside the nacre is lighter than in either *H. fulgens* or *H. corrugata*, and the play of tints not so much broken. The colors are chiefly pink and light green, with here and there a small area of prussian blue. The muscle scar is large, peculiarly and variously striped with olive-brown, green and blue; a portion of it is roughened by coarse raised cords which take a spiral direction. The columellar plate is rather narrow, its lower part sloping inward somewhat. Perforations large, somewhat tubular, 3 or 4 open.

Length 185, width 150, convexity 40 mill.

Length 235, width 185, convexity 58 mill.

Mendocino Co., to San Nicholas Island, California.

H. rufescens SWAINS., Catalogue of the rare and valuable shells which formed part of the collection of the late Mrs. Bligh; appendix, p. 2 (1822).—REEVE, Conch. Icon., f. 6.—SOWERBY, Thes. Conch., t. 5, f. 35.—WEINKAUFF, Conchyl. Cab., p. 69, t. 27, fig. 1. —? *H. ponderosa* ADAMS, Amer. Journ. Sci. and Arts, Second Ser., vi, p. 138, 1848.

This is the Red Abalone of commerce, the nacre of which is used for the manufacture of buttons, for inlaying, etc. The animal is dried by the Chinese in California and used for food.

The *H. ponderosa* of Adams is probably a form of this species. The original description is as follows:

Shell ovate, convex, ponderous, with coarse, unequal incremental striæ and concentric ridges (not folds), and a few broad low tubercles on the ridges; spire elevated, subterminal; four perforations open, the inner one very large; exterior surface brick red; inner surface elegantly iridescent with innumerable shades of delicate red, purplish-red, and green.

Length 8½in.; breadth 6⅞in.; depth within 3½in.

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Comparison with the well-known *H. rufescens* Swains., will render a figure unnecessary. A large specimen of Swainson's shell before me has exactly the same superficial dimensions, but is only 2½ inches deep. *H. ponderosa* is nearly or quite destitute of the spiral waves of *H. rufescens*, is of a darker red without, wants the inner margin of the outer lip, and within has the clouds of iridescent colors remarkably small and numerous, while in *H. rufescens* they are remarkably large. It is more ponderous than any Haliotis which we have seen, weighing 2 lbs., 2 oz., avoirdupois. (*C. B. Ad.*)

H. ASSIMILIS Dall. Pl. 22, fig. 29.

Shell short-oval, very convex, the spire short but projecting above the general outline of the back; surface spirally lirate and having low, rather obscure radiating waves; perforations five; inside silvery, with red, blue and green reflections.

The form is the same as in *H. corrugata*, except that the spire is more produced in the present species. It is solid and strong but not very thick. The epidermis is dull reddish and greenish. Surface sculptured by numerous spiral cords, alternately larger and smaller, and obsoletely waved radiately. Below the row of holes there is a shallow channel; the area between the row of holes and the columellar margin is spirally lirate, and has an obtuse carina in the middle. Inside light, the nacre silvery, red and green; the muscle impression is smooth in the specimens before me. Columellar plate rather narrow, not at all truncated below, sloping inward.

Length 110, breadth 82, convexity 34 mill.

Monterey and San Diego, Cal., in deep water.

Haliotis (*? var.*) *assimilis* DALL, Proc. U. S. Nat. Mus. i, 1878, p. 46.

This is a smaller species than the other Californian Abalones, and curiously intermediate between them in its characters. It resembles *H. fulgens* in having five open perforations, but differs from it in the light tint of the nacre and the unequal spiral cords of the surface. It is like *corrugata* in possessing quite a deep channel just outside of the row of holes, but has a higher spire than that form, less rough sculpture, a greater number of holes, and lighter nacre. Finally we may compare *H. rufescens*, a species more nearly allied, but still readily distinguished by its far thicker and larger shell, fewer holes and other obvious characters.

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H. GIGANTEA Chemnitz. Pl. 7, fig. 42.

Shell very large, rounded-oval, quite convex, distance of apex from margin between one-ninth and one-tenth the length of shell; surface with coarse, low, unequal spiral cords and broad wave-like undulations; perforations on volcano-like elevations.

The typical form of this shell is one of the largest in the genus. It is of a rounded-oval outline, the back quite convex, highest in the middle. It is solid but not very thick, reddish-brown, radiately streaked more or less with chocolate and green. The spiral cords are low but strong, and there are irregular but very strong wave-like obliquely radiating folds above. The perforations are situated in high tubercles upon a strong dorsal angle, below which the left side slopes steeply to the columellar margin; this slope has low spiral cords, waved or festooned below the row of holes, and it has also an obtuse ridge parallel with that row, not far below it. The spire is very small, quite low. Inside there are shallow spiral sulci and indentations at the positions of the cords and waves of the exterior. The nacre is light colored or silvery, to a high degree iridescent, reflections of emerald green and red predominating. The muscle attachment is smooth, but its posterior and lateral outlines are marked by a rugose line. Columellar plate wide, its face concave, sloping inward. Open perforations 4.

Length 220, width 183, convexity 50 mill.

Japan.

H. gigantea CHEMNITZ, Conchyl. Cab. x, p. 167, t. 1610, 1611.—GMELIN, in Linné, Syst. Nat. xiii, p. 3691.—REEVE, Conch. Icon., f. 19.—LISCHKE, Moll. Jap., p. 101; ii, p. 91.—SOWERBY, Thes. Conch. v, t. 7, f. 44, 50.—WEINKAUFF, Conch. Cab., p. 26, t. 4, f. 1, 2.—*H. tubifera* LAM. An. s. Vert. vi, p. 214.—*H. discus* REEVE, Conch. Icon., f. 31.—SOWERBY, t. 5, f. 32.—*H. Kamtschatkana* JONAS, Zeitschr. f. Mal. 1845, p. 168.—REEVE, Conch. Icon., f. 8.—PHILIPPI, Abbild. u. Beschreib. ii, t. 8, f. 12.—SOWERBY, Thes. Conch. v, f. 33, 34.—*H. Sieboldii*, REEVE, Conch. Icon., f. 32 *a*, *b*.—*H. coreanica A. Ad. mss.* teste Weinkauff.

The above description is drawn from a magnificent specimen—the largest on record—in the collection of John Ford, Esq. This typical form may be known by its large size, rounded outline, tubular perforations, etc. The following may be considered varieties:

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Var. KAMTSCHATKANA Jonas. Pl. 9, figs. 47, 49.

Shell oval, rather depressed, rather thin; surface with uneven spiral cords, often almost obsolete, and strongly elevated undulations or lumps; color dull red, green, or red and green marbled. Perforations elevated, 4 in number. Inside silvery, very iridescent; columellar shelf narrow, flattened, sloping inward.

Length 96, breadth 67, convexity 22 mill.

Monterey, Cal., to Kamtschatka.

Var. DISCUS Reeve. Pl. 8. fig. 46.

This is closely allied in all characters to the preceding, but more elongated than the typical *Kamtschatkana*. The interior has a peculiarly metallic luster, light bronze-green and coppery-red predominating. Length 120, width 78, convexity 25 mill.

Japan.

H. Sieboldii Reeve (pl. 15, figs. 78, 79) is in all probability a monstrosity of *H. gigantea*. The single specimen known is in the British museum.

Group of H. tuberculata.

Flattish, oval forms, having a tendency to develope coarse radiating wrinkles. The distribution is like that of the subgenus *Bolma* of *Astralium*,—Japanese and Mediterranean Seas.

H. TUBERCULATA Linné. Pl. 1, fig. 17; pl. 3, figs. 1, 2, 3.

Shell long-oval, much depressed, spire submarginal; spirally striated and more or less wrinkled radiately; holes about 6.

The form is a regular oval, right and left sides about equally curved; it is depressed-convex above, having a slight ridge at the row of holes, and a depression or shallow sulcus below it. The color varies from light gray to reddish-brown spotted or mottled with reddish-brown, pale green, and often speckled with white; surface dull and lusterless, covered with close, unequal spiral striæ and radiating growth-wrinkles. Spire low, 3 to 4 whorled, the distance of the apex from the margin one-tenth to one-twelfth the length of shell. Inside showing 1¼ whorls, nearly smooth, the muscle impression not distinct; the silvery nacre is brilliantly iridescent, with green, steel-blue and red reflections; lip-edge duller. Columellar plate flat, narrow, scarcely truncated at the base. Cavity of spire visible from

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below. Perforations 6 to 8, round, separated by spaces longer than themselves. Length 95–105, breadth 63–73, convexity 15–20 mill.

Atlantic Coast from the Channel Islands to the Canaries, and the entire Mediterranean Sea.

H. tuberculata LINNE, Syst. Nat. x, p. 1256.—JEFFREYS, Brit. Conch. iii, p. 279; v, t. 60, f. 2.—HIDALGO, Mol. Espan. t. 29, f. 3.—WEINKAUFF in Küster's Conchylien Cabinet, p. 3, and of authors generally.—*H. vulgaris* DACOSTA, Brit. Conch., t. 2, f. 1, 2.

(Var. *lamellosa* Lam.)

H. striata LINN., Syst. Nat. xii, p. 1256 (teste HANLEY, Shells of Linnæus).—WEINKAUFF, l. c. (as var. of *tuberculata*).—*H. lamellosa* LAM. Anim. s. Vert. vi, 2d pt., 217, 1822.—BUQUOY, DAUTZ. & DOLLF., Moll. du Rouss. i, p. 426, t. 52, f. 1–7; and of authors generally.—*H. tuberculata* of some authors.—*H. parva* RISSO Hist. Nat. Eur. Mérid. iv, p. 252. — *H. marmorata*, *H. glabra* and *H. bistriata* O. G. COSTA Cat. sist., p. 117, 118.—*H. reticulata* RVE. Conch. Icon., f. 48.—MONTS, Nom. Gen. e Spec., p. 38. —*H. glabra* DILLW.; *H. marmorata* and *bicolor* COSTA; *H. neglecta* PHIL.

This is a very variable species, allied closely to several species of Japan and elsewhere, but the only one of the genus inhabiting European seas. Young shells are more brightly colored than old ones, as usual in the genus. The following varieties may be recognized; but their characters have no constancy, and intermediate specimens are numerous.

Color-var. RETICULATA Reeve. Pl. 24, fig. 66; pl. 47, fig. 8.

Surface without radiating lamellæ or folds; coloration generally mottled or with triangular spots.

This has received the following names: *reticulata* Reeve, *secernenda* Monts, *glabra* Costa, *marmorata* Costa, *bicolor* Costa, *tuberculata var. lucida* Réquien, *varia* Risso.

Mediterranean Sea.

Var. LAMELLOSA Lamarck. Pl. 3, figs. 9, 10.

Like the type in contour, except that the lip-margin is frequently straighter than the other side; the surface more strongly striated spirally, and having coarse, prominent, radiating wrinkles or lamellæ above. Length 72, breadth 45 mill.

Mediterranean and Adriatic Seas.

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It is the *Var. rugosa* of Weinkauff. Lamarck's name is so well known for this form that I deem it inadvisable to revive the doubtful "*striata*" of Linné, which Hanley believes to be the same.

H. SEPICULATA Reeve. Pl. 16, fig. 86.

Shell ovate, spirally peculiarly ridged, ridges narrow, erect, very irregular, radiating, undulately plicated; perforations large, six open; dark olive-green, here and there dotted with white. Well characterized by the erect development of the ridges. (*Rve.*)

Habitat unknown.

H. sepiculata REEVE, Conch. Icon., t. 14, f. 50, 1846.

H. JAPONICA Reeve. Pl. 14, fig. 77.

Shell long-oval, depressed, spire submarginal, its distance from the nearest edge about the same as in *H. tuberculata*. Sculpture composed of *fine close equal spiral threads* and more or less developed radiating coarse folds or elevated wrinkles. Perforations 5 to 7. Yellow, variegated with red, olive-brown and green.

Length 53, width 34 mill.; convexity 12 mill.

Length 89, width 60 mill.; convexity 18 mill.

Japan.

H. japonica REEVE, Conch. Icon., t. 5, f. 13.—SOWB. Thes., t. 4, f. 29.—WEINKAUFF, Conchyl. Cab., p. 58, t. 22, f. 5, 6.—*H. aquatilis* REEVE, Conch. Icon., f. 54.—*H. incisa* RVE. l. c. f. 57.

This species is almost exactly like the Mediterranean *H. tuberculata var. lamellosa*. It differs in having finer, *equal* spiral threads. Weinkauff places *H. reticulata* Rve. in the synonymy of *japonica*, but Monterosato having examined the type in the British Museum, identifies it with a Mediterranean variety of *H. tuberculata*.

H. aquatilis Reeve (pl. 6, fig. 35) is doubtless synonymous. It is from the Kurile Islands, south of Kamtchatka. It has been referred by Schrenck to *H. Kamtschatkana*, but the greater number of perforations (6) and the absence of strong undulation will separate it from that form.

H. incisa Reeve has also been placed in the synonymy by Weinkauff.

H. BISTRIATA Gmelin. Pl. 48, figs. 14, 15, 16; pl. 4, figs. 11, 12.

Shell oval, much depressed, distance of apex from margin about one-eleventh the length of the shell; sculpture consisting of very clearly-cut, low, rounded spiral cords, alternating with narrow

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threads; crossed by a few radiating folds marking the positions of former peristomes, holes five.

The shell is oval, both sides curved; quite depressed and flat, with a wide superficial spiral depression around the middle of the upper surface. The entire surface has spiral cords and striæ. The sculpture has a clear-cut appearance, as if engraved. The area between the row of holes and the columellar margin is wider than usual; it has a strong spiral cord midway, above which it is concave, and below which it is convex. In the middle of the concave portion there is another strong spiral. The color in the typical form is a clear light green, becoming reddish on the spire, and having a pink area on the part of the body-whorl adjacent to the spire. Inside silvery, very bright and somewhat iridescent. Columellar plate narrow, obliquely truncated. Cavity of spire small.

Length 47, width 32, convexity 8½ mill.

Habitat unknown.

H. bistriata GMEL. in Linné, Syst. Nat. xiii, p. 3689.—WEINKAUFF, Conchyl. Cab., p. 9, t. 3, f. 1.

This is the true *bistriata* of Gmelin, agreeing exactly with the figure of Martini to which he refers. I do not know whether the *H. bistriata* of Reeve and of Sowerby (see pl. 4, figs. 11, 12) is the same but think it likely. A specimen before me, drawn on pl. 48, figs. 14–16, agrees with the figure in Chemnitz in a surprisingly minute manner. Another is flecked and speckled all over with brownish-orange on a pink-white and pale green ground. It is very delicate and pretty in coloration, and may be known by its flatness, the wide bi-striate area below the holes, and rather narrow columellar plate. The spirals are minutely granose on the spire; and some shells have very close fine distinct growth striæ all over.

Group of H. stomatiæformis.

This comprises a number of small shells,—the smallest of the genus—distributed from Japan to New Caledonia and eastward to the Viti Islands. The spire is somewhat raised, frequently notably so; the sculpture consists of sharply-cut spiral cords and more or less prominent radiating folds; the holes are few in number and more or less tubular. It may be doubted whether all of the species here admitted are valid.

H. squamata, a larger species than the others, and with numerous perforations, seems to group with the *stomatiæformis*.

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H. STOMATIÆFORMIS Reeve. Pl. 3, fig. 4; pl. 49, figs. 30–35.

Shell small, oval; the spire subterminal; sculptured with clearly, deeply cut spiral cords and radiating folds, which on the last whorl project as little scales on the spiral liræ; holes 3 to 5, somewhat tubular.

The right side is decidedly straighter than the left, the convexity variable. The color is brown, variously marked with white and green. The spiral liræ are deeply-cut, 24–30 in number (counting along the lip-edge) exclusive of 5 or 6 below the row of holes; they are crossed by numerous uneven radiating folds, those on the later part appearing as projecting lamellæ across the riblets. The 5 or 6 unequal spiral cords between the row of holes and the columella are more or less beaded or scaly. The spire is small, not much elevated, its distance from nearest margin one-fifth to one-seventh the total length of shell. Inside silvery, iridescent. Columellar plate wide above, gradually narrowing and not at all truncate toward the base. Holes 3 to 5, subcircular, somewhat tubular.

Length 32, width 20, convexity 7 mill.

Length 31, width 18½, convexity 7½ mill.

New Caledonia! Viti Islands!

H. stomatiæformis REEVE, Conch. Icon., t. 17, f. 74.—SOWERBY, Thes. Conch. v, p. 26, f. 22 (excl. syn. and fig. 23).—*H. exigua* DKR. in Godeffroy Cat. v; and WEINKAUFF in Conchyl. Cab., p. 29, t. 13, f. 2, 3.

I believe this to be the shell to which the name *exigua* was given in the Godeffroy catalogue but without description. Afterward Dunker published another species under the same name. The *stomatiæformis* has a very rough, sharply-sculptured exterior, and the spire-cavity is concealed by the wide columellar lip.

Reeve gives New Zealand as the locality; collectors have not recently found it there; numerous specimens are before me from the localities given above.

H. JACNENSIS Reeve. Pl. 3, fig. 7.

Shell oblong-ovate, spirally peculiarly rudely ridged, ridges very irregular and rather scaly, somewhat smooth next the perforations which are slightly tubiferous and distant; reddish-orange; interior silvery. A very characteristic species, to which there is little or no approximation in any other. (*Reeve.*)

Jacna, Island of Bohol, Philippines.

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H. jacnensis REEVE, Conch. Icon., t. 17, f. 73.—SOWERBY, Thes. Conch. v, p. 28, f. 48.—*H. jacnaensis Rve.*, WEINKAUFF, Conchyl. Cab., p. 70, t. 27, f. 2.

H. ECHINATA Sowerby. Pl. 4, fig. 13.

Shell small, ovate, depressed, brown, concentrically roughened, sculptured with strong spiral liræ over spiny-scaly wrinkles; marginal area roughened and having three spiny ribs; spire rather prominent, acuminate; holes upon tubular tubercles. Small, oval, depressed, dark-brown, concentrically wrinkled, sculptured with strong spiral ridges forming squamose spines on the wrinkles, marginal area with three rows of spines. Unique in Mr. Hanley's collection. (*Sowb.*)

Habitat unknown.

H. echinata SOWB. Thes. Conch. v, p. 18, f. 124.

This seems closely allied to *H. stomatiæformis*, but is of a more oval form, both sides equally curved. Contrary to Mr. Sowerby's surmise, it has nothing to do with *H. gigantea.*

H. EXIGUA Dunker. Pl. 49, figs. 36, 37, 38.

Shell small, ovate, plane, channelled in the middle, spirally densely striate and lirate, obsoletely plicated; provided with five open, close, somewhat tubular round holes; apex a little prominent; spire small, sublateral; inner lip flat; area between margin and holes costate and canaliculate. Color grayish, variegated with reddish, brown or scarlet; nacre vividly iridescent. (*Dkr.*)

Length 22 mill. *Japanese Seas.*

H. exigua DUNKER Mal. Bl. 1877, p. 69; Ind. Moll. Mar. Jap., p. 148, t. 6, f. 8, 9, 10, 1882.—Not *H. exigua* DKR. in Mus. Godeffroy Cat. v, p. 148 (only a name) or of WEINKAUFF, Conchyl. Cab., p. 29, t. 13, f. 2, 3, 1883.

I have not seen this little species. It differs from those with which it is here grouped in showing a larger spire-cavity inside, on account of its less lateral spire. The *H. exigua* of Weinkauff is quite a different thing.

H. ELEVATA Sowerby. Pl. 4, figs. 14, 15.

Shell obliquely subtrapezoidal, Stomatia-shaped, greenish, broadly banded with green toward the angle; spirally elevately lirate, liræ scaly. Spire elevated, coppery; whorls obtusely angular. Having

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the same Stomatia-like form as *H. stomatiæformis*, but with strong scaly ridges, and the whorls of the elevated spire more sloped.

(*Sowb.*) *Habitat unknown.*

H. elevata SOWB. Thes. Conch. v, p. 27, f. 116, 117.

H. HANLEYANA Sowerby. Pl. 11, fig. 59.

Shell red variegated, silvery inside, rough, narrow trapezoidal, with concentric thick elevated undulating wrinkles and spiral elevated liræ, liræ unequal, subalternating. Spire acute, much elevated, whorls angular. Marginal area tuberculate-ribbed. Laminated more thickly and roughly than *H. lamellosa*, and chiefly remarkable for its exserted and elevated spire, in which respect it resembles *H. stomatiæformis*. (*Sowb.*)

Habitat unknown.

H. Hanleyana SOWB., Thes Conch. v, p. 26, f. 28.

This is perhaps a distorted *H. lamellosa* Lam.

H. VENUSTA Adams & Reeve. Pl. 20, figs. 15, 16.

Shell ovate, depressed-plane, spirally delicately ribbed and striated, ribs distant nodulose; foramina sub-prominent. White variegated with vivid scarlet, tinged at the apex with purple. Inside silvery. (*Ads. & Rve.*) *Eastern Seas.*

H. venusta ADS. & RVE. Voy. of H. M. S. Samarang, Zool., p. 69, t. 13, f. 5a, b.—SOWERBY, Thes. Conch. v, p. 29, f. 55.

Compared by Sowerby with *H. concinna*. I have not seen the species.

✓ H. SQUAMATA Reeve. Pl. 18, fig. 2.

Shell long-oval, very convex; spire nearly terminal; surface closely, finely lirate, the liræ finely scaly. Holes small, oval, seven or eight open.

The shell is long, elliptical, with quite convex back. The right side is generally a little straighter than the left. The color is various, but usually a rich dark red or reddish-brown, with yellowish or greenish-yellow stripes and patches. The surface has numerous close, minutely scaly spirals, alternately larger and smaller or with every fourth one larger than the three intervening. There are also elevated plate-like folds developed on the later part of moderate or large specimens, like those of *H. lamellosa* Lam. but less prominent, smaller, more irregular. The spire is very small, subterminal. Inside silvery, iridescent. Columellar shelf concealing the cavity of

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the spire, rather wide, sloping inward. Perforations oval, numerous, seven or eight open. Length 69, width 42, convexity 16 mill.

Northwest coast of Australia.

H. squamata REEVE, Conch. Icon., t. 12, f. 35, 1846.—SOWERBY, Thes. Conch., f. 68, 62.—WEINKAUFF, Conch. Cab., p. 59, t. 23, f. 1, 2.—*H. funebris* REEVE, Conch. Icon., t. 12, f. 38.

This is a species closely allied to *H. stomatiæformis*, differing in being larger and more convex. It is quite distinct from species of the other groups. The spire is more than usually terminal; the spiral riblets closely scaly; the color a rich reddish-brown, varied with yellowish patches, or rarely it is green-tinged yellowish all over, with a few pale red zigzag streaks. Perhaps belongs to the group of *H. diversicolor*.

Var. FUNEBRIS Reeve.

Shell ovate, somewhat depressedly convex, spirally ridged, ridges slightly squamate, here and there larger, transversely peculiarly rugosely plicated; perforations eight or nine open; reddish chestnut sometimes tinged with green, with a few indistinct light flames around the spire. This is a larger and flatter species than *H. squamata*, and the ridges are more widely separated and less squamate. (*Reeve.*)

Australia.

Group of H. pustulata.

H. SPECIOSA Reeve. Pl. 16, figs. 89, 90.

Shell oblong-ovate, flatly convex, depressed in the middle, spirally elevately striated; striæ close-set; 6 perforations open; scarlet red, beautifully variegated with black-edged white. This is a very gay species, the color being a rich scarlet red, variegated with broad zigzag flames, edged along the front with black. (*Reeve.*)

Habitat unknown.

H. speciosa REEVE, Conch. Icon., f. 47.—SOWERBY, Thes. Conch. v, p. 25, f. 107.—Weinkauff, Conchyl. Cab., p. 49, t. 18, f. 7, 8.—*H. janus* REEVE, Conch. Icon., f. 55.—SOWERBY, Thes. Conch. v, p. 25, f. 81.—WEINKAUFF, Conchyl. Cab., p. 64, 65.

I have not satisfactorily identified this species; and I doubt the identity of the specimen described and figured by Weinkauff. The last named author places Reeves' *H. striata* in the synonymy, although he had already considered that to represent a small form of *H. tuberculata* from the west coast of Africa.

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Var. JANUS Reeve. Pl. 9, fig. 48.

Shell oblong-ovate, spirally ridged, ridges fine, narrow, interstices excavated, six perforations open; yellowish-orange, ornamented next to the perforations with a broad white band, colored with large broad spots. The peculiar double style of painting which this shell exhibits is peculiar to the species, and not, as one might be led to imagine, a mere casual variety. (*Reeve.*)

Habitat unknown.

H. ROSACEA Reeve. Pl. 24, figs. 59, 60, 61, 62, 63, 64, 65.

Shell oval, depressed, distance of apex from margin one-eighth to one-tenth the length of shell; closely, finely striate spirally, decussated by still finer and closer growth-striæ; color reddish-brown, generally with white patches; perforations 6.

The right side is not quite as much curved as the left, and the shell is rather depressed. It is quite solid and heavy. The outside is dark reddish-brown, sometimes without markings, but usually having angular patches of white or greenish around the middle part of the body-whorl, and on the spire. The spiral striæ of the surface are fine, close, often disposed in pairs; they are decussated by very close fine radiating striæ. The spire is low, inside silvery, smooth except for fine spiral folds in the nacre, which has light green and red reflections. *Columellar plate flat, wide* (its width one-sixth to one-seventh the width of shell), generally not sloping inward or slightly so, and not distinctly truncate below. Cavity of spire wholly or partly concealed if the plane of the peristome is held at a right angle to the line of vision. Perforations oval, situated in slight prominences, separated by spaces greater than their own length, 5 or 6 in number.

Length 55, width 38, convexity 11 mill.

Length 59, width 41, convexity 11 mill.

West Coast of Africa. (Phil. Acad. Coll.)

✓*H. decussata* PHIL. Abbild. u. Beschreib. etc., iii, p. 89, t. 9, f. 2a, b (April, 1850).—WEINKAUFF, Conchyl. Cab., p. 43, t. 17, f. 3, 4.—*H. virginea* REEVE, Conch. Icon., f. 36 (not *virginea* Chem.).—*H. rosacea* REEVE, Conch. Icon., f. 60 (July, 1846).—*H. marmorata* SOWB. Thes. Conch., t. 11, f. 88, 89.—(Not of Linné nor Gray.)

A species easily recognized by its closely decussated sculpture, broad columella, edged outside with red, and by the outer lip which

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is continued further than usual around the spire, and is very wide and flat at its junction. The description above applies to Philippi's *H. decussata*. The typical *rosacea* is described by Reeve as "marbled with deep coral-red punctured with green." Besides the specimens figured there are others before me obliquely streaked with green, yellow, red and white, much as in the *H. diversicolor* of Reeve. The original figure of *rosacea* is given on pl. 24, fig. 65. Figs. 59–64 of the same plate represent color-varieties in the collection of the Academy. Fig. 62 is Philippi's original of *decussata*.

This species, as well as others, has been supposed by some authors to represent the *H. virginea* of Chemnitz.

Var. STRIATA Reeve. Pl. 50, figs. 3, 4, 5.

This is the "*H. tuberculata*" of Dunker's Moll. Guin. Infer. It has been referred by Weinkauff to *tuberculata* as a variety, but it probably belongs here. It is of a yellowish color, marbled with red and spadiceous.

Lower Guinea.

"It is *Haliotis tuberculata var. striata Martini*" of Weinkauff "*H. striata Linn*" of Reeve (Conch. Icon., f. 58). The true *striata* of Linnæus cannot be identified. Sowerby calls the variety "*marmorata Linn.*"—Another unidentifiable form.

H. RUBIGINOSA Reeve. Pl. 17, fig. 92.

Shell ovate, rather convex, radiately plicately wrinkled, spirally ridged, ridges obtusely scaled; perforations rather approximated, six open. Exterior rusty orange spirally streaked with white.

Besides the peculiarity of sculpture it is very fairly characterized by its rusty orange painting and silvery interior. (*Reeve.*)

Habitat unknown.

H. rubiginosa REEVE Conch. Icon., f. 45, 1846.—SOWB. Thes. Conch. v, p. 30, f. 71.

H. ASTRICTA Reeve. Pl. 4, fig. 19.

Shell ovate, convex, spirally ridged, radiately crossed with irregular raised striæ and laminæ; four perforations open. Exterior marbled with white and olive-green, interior iridescent. Distinguished by the strong decussating sculpture of the cross-ridges. (*Reeve.*)

Habitat unknown.

H. astricta REEVE Conch. Icon., t. 13, f. 41, 1846.—SOWB. Thes. Conch., p. 28, f. 83.

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Of this poorly characterized species Sowerby says: Narrower than *varia*, *pustulata*, and with fine sharp striæ intersecting wrinkles and deep lines of growth. The rugose sculpture is finer and closer, and wants the pustules of *varia*.

H. VARIA Linné. Pl. 17, fig. 99 (type); pl. 17, figs. 91, 93, 100 (vars.); pl. 23, figs. 53, 54, 55.

Shell oval or oblong-oval, convex, distance from apex to margin about one-eighth the entire length of shell; sculptured with numerous very unequal spiral cords; crossed by low radiating folds forming tubercles on the cords; open perforations 5, situated on moderate tubercles.

The right margin is straighter than the left, but still convex; the shell is rather convex especially when well-grown, and in many examples the spire is somewhat conoidally elevated; it is rather solid and strong. The color-pattern is various, but usually consists of broad white or greenish rays upon a dark chocolate, olive-brown or green ground. The surface-sculpture is excessively variable, but in the typical form consists of "swollen nodules ranging across the shell in oblique waves." The spire is rather large. Inside silvery, generally with very little iridescent color; rather indistinctly spirally furrowed, and having slight excavations or pits at the positions of the principal tubercles of the outer surface; columellar plate rather broad and heavy, flattened, and in adult shells sloping inward; not truncated at base. Cavity of spire visible from below. Perforations varying from round to oval.

Length 50, width 35, convexity 13 mill.
Length 47, width 31, convexity 12 mill.
Length 60, width 41, convexity 18 mill.

Australia and Philippines to China; Mosambique, Red Sea, Island of Bourbon, Mauritius, Ceylon, Nicobar Is., Malay Archipelago.

H. varia LINNE, Syst. Nat. xii, p. 1256.—REEVE, Conch. Icon., f. 4.—SOWB. Thes. Conch. v, p. 28, f. 5, 6, 7, 11, 12, 61.—WEINKAUFF, Conchyl. Cab., p. 10, t. 3, f. 4.—MARTENS in Möbius, Reise nach Mauritius, Moll., p. 298.—*H. semistriata* REEVE, Conch. Icon., f. 51*a*, *b*, *c*.—*H. viridis* REEVE, l. c. f. 40.

A widely dispersed form, variable in both color and sculpture. It may be distinguished from the following several species by the narrow unequal spiral cords, which are rounded, not broad and flattened, and bear unequal tubercles at uncertain intervals.

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The form called *semistriata* by Reeve is figured on pl. 17, figs. 93, 100. It is reddish-brown, the earlier portion, radiately striped with white, the body generally with a wide white spiral stripe in the middle, as shown in fig. 100. Toward the spire from this stripe the surface is sharply sculptured by close, rounded, spiral cords; but outside the stripe it is much smoother, having the cords almost obsolete, but generally with one or two low, nodulous spiral ridges. Holes 4 to 5, on tubercles.

The *H. viridis* of Reeve, pl. 17, fig. 91, is whitish, stained and radiately marbled with green. It is undoubtedly synonymous. This is not, however, the shell Weinkauff identifies as *viridis*.

A form which may be called variety *pustulifera* is figured on pl. 23, fig. 52. It is chocolate or olive-brown, radiately painted with broad flames of white finely reticulated with olive-green. The surface is comparatively smooth except for three or four spiral rows of small pustules. It is the form figured by Weinkauff as *varia* (Conchyl. Cab., t. 3, f. 4); I consider Reeve's figure of *varia* the type-form of that species. See pl. 17, fig. 99.

H. DRINGII Reeve. Pl. 5, fig. 25.

Shell orbicularly ovate, spirally striated, radiately plicated and tuberculated; perforations a little tubiferous, four open. Exterior pale greenish yellow, conspicuously stained in the middle with scarlet; interior silvery. (*Reeve.*)

North coast of Australia.

H. dringii REEVE, Conch. Icon., t. 17, f. 65.—SOWERBY, Thes. Conch. v, p. 32, f. 42.

This may be a young shell.

H. CONCINNA Reeve. Pl. 5, figs. 21, 22.

Shell somewhat oblong-ovate, spirally striated, slightly tuberculated in the middle, obliquely rather obscurely plicated. Four perforations open. Fleshy-white, profusely variegated with scarlet rose. (*Reeve.*)

Zamboanga, Island of Mindanao, Philippines.

H. concinna REEVE, Conch. Icon., f. 66.—SOWERBY Thes. Conch. v, p. 28, f. 46, 54.

This may be compared with *H. varia*, the young of which it seems to resemble. Sowerby says that Reeve named the species from a very young and uncharacteristic specimen, and gives a figure and

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diagnosis of a larger one (fig. 22). "Shell complanate, subovate, wide behind, somewhat narrower in front, milk-white variegated with red and green; spirally lirate, the liræ distant, elevated, undulately nodose, interstices irregular, narrow; holes a little prominent, small; apex almost immersed. The sculpture is somewhat finer, but quite as irregular as in *H. varia*. The flatness and breadth of the spire and comparative attenuation of the anterior give a different appearance to the shell. The prevalence of bright scarlet in the markings is noticeable."

This species is considered by Weinkauff a synonym of *H. unilateralis* Lam.

H. UNILATERALIS (Lam.) Weinkauff. Pl. 17, figs. 97, 98.

Shell egg-shaped or long oval, depressed-convex, rough, encircled by spiral liræ, which above are beset with low tubercles; variegated or marbled with orange, red and white, and strewn with little brown flecks and a few larger ones. Spire distinct and rather lateral in position, little elevated, with numerous scarcely elevated perforation-tubercles, of which five remain open. They are more nearly circular than oval. Inside scarcely furrowed, having silvery nacre giving very faint reflections of red. Cavity of the spire visible and surrounded by a riblet. Columellar plate curved, pretty wide, especially above, margined outside, produced inward, emarginate below. Lip short, thin and blunt, scarcely crenulated. (*Weinkauff.*)

Timor and Australia (Lam.); Philippines (Cuming); Mascarene Is. (Robillard); Massana, in the Red Sea (Jickeli); Suez (M'Andrew).

H. unilateralis LAM. Anim. s. Vert., vi, p. 217.—WEINKAUFF, Conchyl. Cab., p. 55, t. 21, f. 4. 5.

I have given Weinkauff's description and figures of this species. I have not seen specimens. Weinkauff considers *H. concinna* Rve. a synonym.

H. PAPULATA Reeve. Pl. 3, fig. 6.

Shell somewhat orbicularly ovate, spirally obtusely ridged, ridges rather distant, conspicuously tuberculated; perforations a little tubiferous, four open; dark coral-red, variegated here and there with patches of yellow.

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The pimpled sculpture of this shell is of a much more prominent character than that of *dringii*, *concinna* or *gemma*. (*Rve.*)

North Coast of Australia.

H. papulata RVE. Conch. Icon., t. 17, f. 69, 1846.

Probably immature, but not a young *ovina* as Sowerby surmises.

H. GEMMA Reeve. Pl. 7, fig. 37, double natural size.

Shell somewhat orbicularly ovate, flatly convex, left side rather broad; spirally tuberculated, radiately very beautifully minutely plicately scaled; perforations a little tubiferous, four or five open; yellowish, stained with scarlet and green.

The surface of this beautiful little species besides being tuberculated, is covered with minute scales, which present a rather more prominent character on the left side beneath the perforations. (*Rve.*) *Habitat unknown.*

H. gemma RVE. Conch. Icon., f. 67, 1846.

This is evidently a very young shell, whether a distinct species or not can only be determined by an examination of the type.

H. DOHRNIANA Dunker. Pl. 7, figs. 39, 40, 41.

Shell ovate-oblong, subelliptical, little convex, white and rose variegated, with large brown or greenish, often subquadrate spots toward the margin; sculptured with oblique folds and 34 to 36 close, subimbricately nodose spiral riblets; transversely striated. Perforations 4, subtubulose; part between perforations and lip sloping, subexcavated. Columella wide, flat. Nacre brilliant silvery, a little iridescent.

There lie before me three specimens of this species, having much the same general form and sculpture; one is more elliptical in contour. The moderately convex shell is covered with closely crowded spiral riblets, of about equal size, and 34 to 40 in number. Toward the margin they have blunt, erect scales, and here and there are nodose. The margin is sloping, concave in the middle, and traversed by 6 to 8 cords like the spirals of the upper surface. Four holes are open. The inner lip is flat aud pretty wide; the nacre white and unusually brilliant, but only slightly iridescent. (*Dunker.*)

New Hebrides.

H. dohrniana DKR. in Novit. Conch., p. 48, t. 15, f. 13–15.

This seems to be very closely allied to certain forms of *H. pustulata* Reeve.

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H. PLANATA Sowerby. Pl. 11, fig. 58; pl. 49, figs. 20, 21, 22.

Shell oval, very flat, solid, spire not at all raised, distance of the apex from the nearest margin about one-sixth the length of the shell. Surface sculptured with numerous uneven spiral cords; open perforation five.

The outline is oval; it is very much depressed, flatter than any other species. Outside it is chocolate brown stained in places with green, having oblique, branching streaks of cream-white, or blotches of the same tint. The sculpture consists of numerous spiral cords separated by deep grooves, the cords more or less nodose from the intersection of uneven radiating folds, often obscure. Toward the lower end, outside of the row of holes, the cords are obviously scaly or granose. Spire plane, generally eroded and white. Inside silvery, iridescent, spirally grooved. Columellar plate very wide above, flat, not quite covering the small spire-cavity. Perforations four to five, small, oval, their edges a trifle raised.

Length 41, width 29, convexity 6½ mill.

Philippines (Sowb.); *Viti Islands* (Garrett!).

H. planata (CARPENTER, where?) SOWERBY, Thes. Conch. v, p. 30, fig. 74.

This is the flattest species I have seen. The columellar ledge is very wide and flat above; the coloration is peculiar but variable in pattern. I have been unable to find that Carpenter described such a species.

H. CRUENTA Reeve. Pl. 4, figs. 17, 18; pl. 49, figs. 24, 25, 26.

Shell oval, depressed; distance of apex from nearest margin one-sixth to one-seventh the length of shell; finely spirally striate; holes 8, small, circular.

The shell is about the size and shape of *H. pustulata* but is finely striate spirally. The right side is straightened, the color is a rich reddish-brown varigated with creamy markings. Surface spirally marked with unequal striæ, and having some wrinkles marking the places of former peristomes. The spire is only a trifle raised. Inside it is silvery and beautifully iridescent, nearly smooth. The columellar plate is wide above, as in *pustulata* (see fig. 24, pl. 49). Cavity of spire rather large. Holes numerous, small, circular.

Length 46, width 29, convexity 9 mill.

Habitat unknown.

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H. cruenta REEVE, Conch. Icon., t. 15, f. 56.—SOWB. Thes. Conch., f. 63, 101.—WEINKAUFF, Conchyl. Cab., t. 24, f. 4.

Closely allied to *H. pustulata* but at once separated from that by its fine spiral striation. There are traces of pustules on some of the wider striæ on the earlier portion of the whorl. Reeve gives the locality "New Zealand"; but it has not been found there by resident collectors. Hutton says: "perhaps the same as *rugosoplicata*" —a complete misapprehension, as it has no affinities whatever with that shell.

H. ANCILE Reeve. Pl. 5, fig. 23.

Shell ovate, uniformly convex, faintly spirally nodulously striated, nodules sometimes nearly obscure, interrupted; perforations numerous, small, eight open; olive-green, nodules and around the spire coppery-rose-red.

A uniform, convex shell, striated with faint interrupted, irregular, nodulous striæ of a coppery-rose hue, with the perforations small and numerous. (*Reeve.*)

Habitat unknown.

H. ancile REEVE, Conch. Icon., f. 71.—SOWERBY, Thes. Conch., f. 65.—WEINKAUFF, Conchylien Cab., t. 28, f. 3.

Closely allied to *H. pustulata*, perhaps not specifically distinct.

✓H. PUSTULATA Reeve. Pl. 11, fig. 57; pl. 23, figs. 48, 49, 50, 51, 56, 57, 58.

Shell oblong, depressed, the distance of apex from margin about one-seventh to one-eighth the length of the shell. Sculptured with coarse unequal spiral cords separated by deep interstitial grooves, usually more or less obviously radiately plicate in the vicinity of the spire, the penultimate and beginning of the last whorl usually having series of small pustules along the spiral cords; growth-striæ very close and fine; perforations generally 6.

The right side is almost a straight line from its junction with the spire to the termination of the row of holes; the left margin is arched; the body is less convex than in most specimens of *H. varia*. The coloration of the typical form is a dark irregular mottling of brown, green and sometimes whitish; but many specimens are a rich chestnut marbled with yellow or white, or are light yellowish-brown with reddish-chestnut spots. None of the shells before me have the broad radiating flames characteristic of *H. varia*. The surface has numerous strong unequal spiral cords, more or less undulating and

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more or less tubercled, especially on the earlier part. There are usually low wave-like radiating folds on the inner part of the body-whorl, but these are often absent. There is great variation in the degree of elevation of the spire. Inside *silvery*, with red and green reflections, *strongly spirally grooved*. Columellar plate wide, flat or a little concave, scarcely truncated at base. Cavity of spire rather deep, the rib bounding it having a shallow furrow around it.

Length 50, width 30, convexity 11 mill.

Length 53, width 33, convexity 11 mill.

Ceylon and the Red Sea to Mosambique; Mauritius.

H. pustulata REEVE, Conch. Icon., f. 52.—WEINKAUFF, Conchyl. Cab., p. 45, t. 17, f. 5–8 (as "*pustulosa*").—SOWB. Thes. Conch. v, p. 28, f. 112.—MARTENS, Möbius' Reise n. Mauritius, Möll., p. 298.—*H. alternata* SOWERBY, Thes. Conch. v, p. 23, f. 51.

This is an excessively variable form, allied to *H. varia*, but distinguished by the *coarser and flattened* cords of the surface. The following forms I believe to be mere varieties; the development of the spiral sculpture is excessively variable and irregular, and cannot be depended upon for specific distinctions in the group of species immediately surrounding *H. varia*.

Var. SCUTULUM Reeve. Pl. 18, fig. 5.

Shell convex, spire depressed, rather concealed, spirally faintly ridged, ridges flattened, waved, here and there larger; 6 holes open; olive-brown very beautifully articulated dotted and spotted with green. The ridges of this shell have a peculiar undulating character, and toward the middle of the shell are arranged one broad and three narrow alternately. (*Reeve.*)

H. scutulum REEVE, Conch. Icon., f. 63.

Var. PERTUSA Reeve. Pl. 8, fig. 45.

Shell oblong-ovate, spirally posteriorly very finely grooved, grooves pricked, anteriorly faintly ridged, grooves and ridges rather irregular and waved; 6 perforations open; exterior ruddy-brown with a few yellowish zigzag streaks near the spire, interior brightly iridescent. One half the shell is sculptured with faint pricked grooves, the other with fine waved ridges. (*Reeve.*)

H. pertusa REEVE, Conch. Icon., f. 61.

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Var. NEBULATA Reeve. Pl. 46, fig. 1.

Shell oblong-ovate, convex, spire rather elevated, spirally grooved, grooves small, waved, perforations rather approximated, 7 open; clouded throughout with brown and red. (*Reeve.*)

H. nebulata REEVE, Conch. Icon., f. 49.

This variety forms a transition to *H. revelata* Desh.

H. REVELATA Deshayes. Pl. 15, figs. 81, 82.

Shell ovate-oblong, depressed, a little convex above, broadly open beneath; whorls 3, the last large, obsoletely longitudinally sulcated, having 7 narrow perforations; brown marbled with white and green, vividly pearly inside, columella flat, subtruncated below. (*Desh.*)

Length 61, breadth 37, convexity 15 mill.

Island of Bourbon (Réunion); Mauritius.

H. revelata DESH, Moll. de l'ile de la Réunion, p. 70, t. 9, f. 1, 2. —MARTENS in Möbius Reise n. Mauritius, p. 298.

This is an extreme form of the series of *pustulata* and *nebulata*. It is smoother than the other forms, and the apex is more terminal.

H. ZEALANDICA Reeve. Pl. 3, fig. 5.

Shell oblong, rather depressed, spirally irregularly grooved, intermediate ridges obtuse, now broad, now narrow; 6 holes open; exterior peculiarly marbled with reddish-chestnut and red-tinged white. (*Reeve.*)

New Zealand (?)

H. zealandica REEVE, Conch. Icon., f. 64, 1846.—HUTTON, Manual of New Zealand Mollusca, 1880, p. 105.—*N. novæ zeelandiæ Reeve*, MARTENS, Critical List. Moll. N. Z. 1873, p. 34.

This is a form very similar to certain varieties of *H. pustulata* or *nebulata*, but is narrower with more terminal apex.

It may also be compared with *stomatiæformis*.

H. RUGOSA Reeve. Pl. 12, fig. 64.

Shell ovate, convex, slightly depressed in the middle, radiately plicately wrinkled, spirally ridged, ridges obtuse, here and there larger; perforations rather large, 4 open; exterior marbled with olive-brown and green. The ridges of this species are somewhat irregular near the apex, but in the middle they are arranged alternately one broad and three narrow. (*Reeve.*)

Habitat unknown.

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H. rugosa REEVE, Conch. Icon., f. 59 (not *H. rugosa*, LAM. an unidentifiable species, said by Lamarck to lack nacre).—*H. strigata* WEINKAUFF, Conchyl. Cab., p. 20, t. 2, f. 8.

A form closely allied, apparently, to *H. pustulata*.

H. COCCINEA Reeve. Pl. 10, figs. 54, 55; pl. 47, figs. 5, 6, 7.

Shell oblong, depressed, the spire small, elevated, distance of apex from margin one-fourteenth to one-seventeenth the entire length of shell. Surface spirally ribbed; color reddish-chestnut with very irregular white patches and radiating zigzags; perforations 5.

The right side is nearly straight, the left curved; body-whorl convex. It is moderately solid; the surface on both sides of the row of perforations has close spiral cords, alternately larger and smaller, their interstices usually occupied by minute spiral threads. The spire is rather elevated, whorls about 2½. Inside it is silvery with red and green reflections, a little blue showing in some lights; muscle impression not distinct; columellar plate not wide, somewhat flattened, a little truncated below. Cavity of spire visible from below, but half concealed by the columellar plate. Perforations 5, almost perfectly circular, situated on low tubercles and separated by spaces of twice their own diameter.

Length 52, width 30 mill; convexity 10 mill.

Cape Verde Islands?

H. coccinea REEVE Conch. Icon., f. 22, 1846.—SOWB. Thes. Conch. v, f. 64, 95, 120.—WEINKAUFF, Conchyl. Cab., p. 41, t. 16, f. 5, 6. —*? H. maculata* KUSTER, Weinkauff, Conchyl. Cab., p. 83, appendix; t. 2, f. 7.

I do not believe this to be a variety of *H. tuberculata;* it is a wholly different thing. The spiral cords are far coarser than in that species. I am far from placing confidence in the locality given by Reeve. No one who has written on the Cape Verde fauna has found the species. It may prove to be an Indo-Pacific form. The specimen before me is figured on pl. 47, figs. 5, 6, 7.

H. ELEGANS Koch. Pl. 13, fig. 70.

Shell elongated, rather narrow, subtruncate at base, spirally densely and deeply sulcate, scale-ridged ferruginous-buff, marbled and flamed with red. Inside lightly grooved, brilliantly pearly. Spire very short.

This beautiful and rare mollusk is distinguished as well by its long drawn out form as by the shining nacre, which shows furrows

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corresponding to the ribs of the outer surface. The outer surface is closely and deeply furrowed by rough, prominent spiral ribs; these are closely scaly, and often between two thicker ones there is a weaker lower riblet. A few folds in the direction of growth-striæ make the surface still rougher, and are also visible on the inside. The color is a dirty yellowish-brown, flamed and marbled with reddish-brown, especially in young individuals. (*Phil.*)

Length 80, breadth 43, convexity 16 mill. (ex icon.)

Port Adelaide, and West coast of Australia.

H. elegans KOCH in PHILIPPI, Abbild. u. Beschreib. i, p. 119, t. 1, f. 1, 2, 1844.—REEVE, Conch. Icon., t. 7, f. 21.—SOWERBY, Thes. Conch. v, t. 11, f. 82, t. 14, f. 119.—WEINKAUFF, Conchyl. Cab., p. 51, t. 20, f. 2–4.

An elegant species which I have not seen. The form is exceptionally slender. There are about 8 holes open.

Group of H. diversicolor.

These are oval shells, quite convex on the back and not so carinated at the row of holes as are the forms grouping around *H. pustulata, varia,* etc.

✓ H. DIVERSICOLOR Reeve. Pl. 15, fig. 80.

Shell long, oval, the spire very near the margin, surface spirally lirate; colors reddish-brown, scarlet and green in irregular patches and streaks; holes usually 7 to 9. Inside silvery.

The two sides are equally curved, and the back is quite convex. Coloration very variable. Surface spirally lirate, the liræ unequal, rounded, crossed by low folds indicating former positions of the peristome. There is no angle at the row of perforations, and the space between perforations and columellar margin has unequal spiral cords, not coarser than those of the rest of the disk. Inside silvery, with light green and red reflections. Columellar plate rather narrow, flattened, sloping inward, *not in the least truncate at base,* so wide above as to wholly conceal the cavity of the spire. Perforations oval, 7 to 10 in number.

Length 63, width 41, convexity 12 mill.

Length 86, width 57, convexity 19 mill.

Australia (Reeve); *China; Nagasaki, Japan.*

H. diversicolor REEVE, Conch. Icon., f. 39, June, 1846.—SOWERBY, Thes. Conch. v, p. 27, f. 69.

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A form variable and rather bright in coloration, distinguished by its long oval form, numerous perforations and spiral liration. The following seem to be varietal modifications.

Var. TAYLORIANA Reeve. Pl. 15, fig. 83.

Shell oblong-ovate rather solid, convex, spire nearly terminal; spirally obtusely and irrrgularly ridged; seven to nine perforations open; exterior scarlet-brown, clouded near the spire with yellow spotted with scarlet-brown. Interior white. (*Reeve.*)

Habitat unknown.

H. tayloriana RVE., Conch. Icon., f. 43.—WEINKAUFF, Conchylien Cabinet, p. 57, t. 13, f. 1, 4; t. 22, f. 3, 4.

Var. GRUNERI Philippi. Pl. 47, figs. 1, 2; pl. 6, fig. 31.

Shell elliptical, moderately but equally convex, rufous, almost unicolored; sculptured with 35 to 40 elevated, spiral liræ, alternately larger and smaller, between spire and perforations, and about 9 irregular ones on the columellar slope; open perforations 7, little produced.

The form of this species is almost exactly elliptical; the convexity even, without the depression so prominent as in *H. sanguinea, speciosa*, etc. The segment between the row of holes and the columella is also evenly curved. The wave-like folds, parallel to the lip-edge are wanting or indistinct. The elevated spiral liræ are very regular, alternating broader and narrower, separated by narrow deep furrows, and cut by close growth-striæ. The spire is very small, and stands almost perpendicularly over the margin. The color is brown-red, almost concolored, but whitish with beautiful red flecks toward the spire. The inner lip lies completely horizontal, and is pretty broad. The nacre is white and iridescent. The shell is rather thick. (*Phil.*)

China.

H. Gruneri PHIL. Zeitschr. f. Mal. 1848, p. 16; Abbild. u. Beschreib. iii, t. ix, f. 1.

Philippi's excellent description is translated above. Specimens before me correspond with it. A variegated specimen is figured by Lischke. (See pl. 6, fig. 31.)

H. GRAYANA Sowerby. Pl. 6, figs. 32, 33.

Shell depressly ovate, effused posteriorly on the right side; spire nearly terminal; spirally, flatly ribbed, intermediate ridges rather

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excavated, six or seven perforations open; dark green, marbled with red, interior whitish. (*Reeve.*)

Habitat unknown.

H. marmorata Gray in REEVE, Conch. Icon., f. 44 (not *H. marmorata* Linn.).—*H. Grayana* SOWERBY, Thes. Conch. v, p. 20, f. 87, 111.

Probably closely allied to *H. diversicolor*, but the lip seems to be continued a greater distance around the spire.

H. GLABRA Chemnitz. Pl. 9, fig. 50; pl. 12, fig. 63.

Shell oval, depressed, marked with arrow-shaped olive or green spots on a lighter ground; surface nearly smooth, perforations small, six to eight in number.

The shell is oval or elliptical, right and left sides equally curved; depressed, the spire small, lateral, scarcely projecting above the general outline of the shell. The ground-color is whitish-green, mottled and marked all over with triangular or arrow-shaped spots of green or olive. The surface is smooth except for very light growth-striæ and narrow impressed spiral lines; there are a few narrow raised striæ between the row of holes and the columellar margin. Inside silvery, iridescent. Columellar plate flat, wide above, gradually becoming narrower toward its base. Cavity of spire minute, concealed. Perforations generally 6 or 7, small, their edges not raised. Length 47, width 32, convexity 8 mill.

Philippines; Australia.

H. glabra CHEM. Conchyl. Cab. x, p. 311, t. 166, f. 1602, 1603.—GMELIN in Syst. Nat. xiii, p. 3690.—REEVE, Conch. Icon., f. 2, and of authors generally.—*H. ziczac* REEVE, Conch. Icon., t. 8, f. 24.

This is one of the smoothest species. Its oval form and the green arrow-shaped blotches of the surface well distinguish it. The *H. ziczac* of Reeve (pl. 12, fig. 63) is founded on a specimen having slightly more prominent spiral striæ.

H. SUPERTEXTA Lischke. Pl. 6, figs. 28, 29, 30.

Shell ovate, closely, densely lirate, radiately obsoletely plicate, olivaceous or grayish-rufous, variegated with blood red, having streaks of red and green; liræ nearly equal, crossed by lamellæ and very close erect scales, separated by deeply cut grooves. Spire small; perforations 6–7 open, rounded-ovate; columellar margin subplane.

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The whole shell is traversed by spiral cords, nearly regular, almost equal in size, and covered with very numerous close lamellæ, part erect, part scale-like, looking like threads spun over it. The liræ are separated by deeply cut furrows, showing growth-lines, and in old examples an interstitial thread is developed on the part nearest the outer lip. There are besides, in the neighborhood of the apex, irregular longitudinal folds, and on the rest of the surface a few indistinct ridges indicating periods of growth. The carina has in three specimens 6, in one 7 open perforations. The portion between the row of holes and the columella slopes obliquely with very slight indication of a depression. The younger examples are olive-yellow or grayish-reddish, with blood-red flecks, and the earlier half of the older ones is the same, but somewhat darker; the latter portion of the surface marked with a few brownish-red and green streaks. The columellar plate is bordered outside by a narrow brownish-red edge. The inside of the shell is marked by narrow spiral and broader longitudinal depressions, corresponding to those of the outer surface, the longitudinals being more conspicuous within than outside. The nacre is white, with red and green reflections. (*Lischke.*)

Length 61, width 42 mill.

Nagasaki, Japan.

H. supertexta LISCHKE, Japanische Meeres-Conchylien 2ter Theil, p. 92, t. 6, f. 13, 14, 15; Mal. Bl. xvii, p. 24 (July, 1870).—WEINKAUFF, Conchyl. Cab., p. 42, t. 16, f. 7, 8.

Distinguished by the sculpture of close, elevated lamellæ of growth over spiral liræ. The form belongs to the circle of *diversicolor Tayloriana, Japonica* and *Gruneri*—a group, the Japanese species of which need thorough revision by someone having more material than any of the authors who have yet written on *Haliotis*, the variations of sculpture being peculiarly perplexing.

✓ H. VIRGINEA Chemnitz. Pl. 47, figs. 9, 10; pl. 17, figs. 94, 95, 96; pl. 18, figs. 3, 4; pl. 6, fig. 34.

Shell oblong-oval, very convex; *spire almost terminal;* spirally lirate, having a few radiating wrinkles, sometimes obsolete; perforations small, oval or rounded, about 7 in number.

The outline is oval, right and left sides equally curved, widest at about the middle; back very convex, not carinated at the row of holes, but having a very shallow excavation just below it. Color

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dark brown marked with more or less perfect V-shaped green streaks, green sometimes predominating. Surface spirally lirate, liræ sometimes unequal, about 44 in number between spire and perforations; they are rendered somewhat beaded by growth-striæ; there are some small folds radiating from the spire over the middle part of the back, but these are obsolete on some examples. The spire is almost terminal, very small; whorls 2½. Inside spirally striate, somewhat corrugated obliquely, very brilliantly iridescent, the prevailing colors green and red. Columellar plate flattened or a little concave, decidedly sloping inward, subtruncate at base, concealing the cavity of spire above. Perforations 6 or 7, separated by spaces exceeding the length of the holes.

Length 54, width 35, convexity 13 mill.

New Zealand; Australia.

H. virginea CHEMNITZ, Syst. Conchyl. Cab. x, p. 314, t. 166, f. 1607, 1608.—GMELIN, Syst. Nat. xiii, p. 3690.—SOWERBY, Thes. Conch. v, p. 20.—DUNKER, Ind. Moll. Guin. Infer., t. 5, f. 6, 7, 8 (not of REEVE).—*H. gibba Phil.*, REEVE, Conch. Icon., f. 42.—SMITH, Voy. Erebus & Terror, Zool., Moll. p. 4, t. 1, f. 16.—HUTTON, Manual N. Z. Moll., p. 104, 1880 (not *H. gibba* Phil.).—*H. subvirginea* WEINKAUFF, Conchyl. Cab., p. 33, t. 13, f. 7, 8; t. 17, f. 1, 2.

A small species having a dull brown-and-green exterior, spirally lirate and with a cluster of wrinkles (well shown in fig. 9 of pl. 47). Inside it is exceptionally iridescent with metallic green and red reflections. The outside sometimes has distinct V-shaped green stripes, dotted with white; and in these examples the area between the row of holes and the columella has a number of vertical white bars across it. I have no doubt that this is the true *virginea* of Chemnitz, although there has been a great deal of confusion in the monographs. I cannot agree with those writers who identify the form with *H. gibba* Phil.; for the description of that species indicates a different specific type.

H. Huttoni Filhol (Comptes Rendus xci, p. 1094) is probably a variety of this. I have not seen the description.

H. GIBBA Philippi. Pl. 47, figs. 3, 4.

In its great convexity, dark brown color and small lateral spire this species is very distinct. I count about 20 elevated transverse lines as far as the row of perforations, between them still smaller

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ones are placed; oblique waves (similar to those of *H. iris* and *australis*) cut these, so that it appears somewhat granose. The space below the row of perforations also has longitudinal lines, and besides these a broad but shallow channel, such as occurs in so many species. The perforations are circular, their diameters about half the width of the interspaces. Five of them are open. The nacre is whitish. Length 24½, width 18¼, alt. 9 lines.

Australia?

H. gibba PHIL. Abbild. u. Beschreib. ii, Haliotis, t. 4, f. 2*a*, *b* (Feb. 1846); not of Reeve and others.

The above paragraph is a translation of Philippi's description, and the figures are drawn from his. No one has identified this form since its original publication, so far as I know. It is separated from *H. virginea* Chem. (*subvirginea* Weinkauff, *gibba* Reeve) by its greater convexity, greater width, fewer, more separated, *round* perforations, and the less numerous spiral riblets.

H. CRISPATA Gould. Pl. 16, figs. 87, 88.

Shell small, very thin and delicate, of an elongated oval, and more than usually convex form, the surface marked with fine, regular, equal, revolving threads, and with very delicate, branching, oblique, zigzag ripples, which are almost equally conspicuous in the interior. The spire is prominent, of a little less than three whorls, the apex nearly on the median line. The perforations are small, rounded, slightly tubular, numerous and crowded, six or seven of them open; and external to the series is a deep canal. The color is bright brick-red or red-lead color, having between the canal and the margin a few narrow and distant yellowish-white stripes. The interior is brilliant, silvery, and somewhat iridescent. (*Gould.*)

Length an inch and three-eighths; breadth seven-eighths of an inch.

Australia?

H. crispata GLD. Proc. Bost. Soc. N. H. ii, p. 251, Dec., 1847; U. S. Expl. Exped. Shells, p. 208, f. 248, 248a.

About the size and form of *H. stomatiæformis* Rve., but distinguished from all others by its crowded angular ripples, arranged somewhat like the colors on *H. ziczac*. No shell approached it in this respect except the very young of *H. Australis*. (*Gld.*)

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Group of H. iris.

A beautiful shell, well-named *iris*, is the type of this group. It is peculiar in having the lips continuous and united across the spire end.

H. IRIS Martyn. Pl. 13, figs. 65, 66.

Shell oval, the two sides equally curved; convex; spire oblique, short, whorls 2; surface pitted; lip continuous, produced beyond the body-whorl; inside dark metallic blue and green, with yellow reflections; muscle impression distinct, roughened.

The back is convex, angled at the row of perforations; outside pale brown or light olive-green, pitted as if by the intersection of two series of low oblique folds. The spire is very short, with fewer whorls than usual. Inside it is brilliantly pearly, prussian blue and green predominating, but with reflections also of purple, orange and a little red. The columellar plate is broad, passing into the expanded continuation of the outer lip above, not truncate below; its face is flattened, and slopes inward; cavity of spire small. Perforations 5 to 7 open. Length 95, width 70, convexity 25 mill.

Chatham Is., Auckland Is.; Auckland to Dunedin, New Zealand.

H. iris MARTYN, Univ. Conch. ii, t. 61.—REEVE, Conch. Icon., f. 37.—SOWERBY, Thes. Conch. v, p. 20, t. iii, f. 24, 25.—WEINKAUFF, Conchyl. Cab., p. 11, t. 4, f. 1, 2.—HUTTON, Manual of Moll. N. Z., p. 104, 1880.

A beautiful species, quite distinct from all other forms. Weinkauff gives Viti Islands as a locality, and Reeve says Kangaroo Island, Australia. It is known however to be an abundant New Zealand species, and other localities require confirmation.

Group of H. rugosoplicata.

H. RUGOSOPLICATA Chemnitz. Pl. 20, figs. 12, 13.

Shell oval, quite convex, distance of apex from margin one-eighth to one-ninth the length of shell; sculpture consisting of faint spirals and a close strong radiating corrugation; perforations circular, their edges elevated, 6 to 8 in number.

Outlines oval, the right margin a little straighter; back convex, not carinated at the row of holes; thin, light yellowish-brown, red on the spire, or light green flamed with red. The surface has almost obsolete spiral cords, and regular, close, radiating folds; between the row of holes and the columellar margin there are no radiating folds,

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but several (generally three) strong spiral ribs. Spire a little elevated, whorls 3. Inside corrugated like the exterior, silvery with blue, green and red reflections, the latter predominating. Columellar plate narrow.

Length 94, width 71, convexity about 30 mill.

Length 82, width 56, convexity 22 mill.

Omaha to Dunedin, N. Zealand; Chatham and Auckland Is.; S. Australia.

H. rugoso-plicata CHEM. Conchyl. Cab. x, p. 311, t. 166, f. 1604, 1604*a*.—REEVE, Conch. Icon., f. 7.—SOWERBY, Thes. Conch. v, p. 21, f. 9, 10, 53.—WEINKAUFF, Conchyl. Cab., p. 15, t. 6, f. 5, 6.—*H. australis* GMEL., Syst. Nat., p. 3689.—*H. ruber* LEACH, Zool. Misc. i, p. 54, t. 23, *teste* DILLWYN.—*H. costata* SWAINSON Appendix Bligh Cat., p. 3.

The corrugated exterior is quite constant and characteristic. Young specimens are more strongly ribbed spirally, and often have radiating stripes of red on a delicate green ground.

Group of H. mariæ.

H. MARIÆ Gray. Pl. 19, figs. 10, 11.

Shell large, oval, convex, distance of spire from margin (in the specimen before me) about one-fifteenth the length of shell; sculpture consisting of very strong squarish spiral ribs, separated by wide excavated interstices; perforations 5 or 6 open.

The right margin is quite convex, especially in the part of the lip adjacent to the spire; the back is convex; it is not carinated at the row of holes, but there is a shallow sulcus just below it. The color is a reddish-brown, with irregular zigzagly radiating white flames. The surface has very prominent unequal spiral ridges, often double, or divided by a groove in the middle; the number is variable, the specimen before me having thirteen. The spire is near the margin, not elevated, and something like that of *H. iris* in being few-whorled. Inside silvery, with red, blue and green reflections, the nacre sulcated spirally. Columellar ledge flattened, becoming gradually narrower below, not at all truncated; cavity of spire almost concealed by the overhanging columellar plate, very small, scarcely spiral. Perforations 5 or 6, subcircular, their edges moderately prominent.

Length 109, width 84, convexity 21 mill.

Australia.

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H. mariæ GRAY in Wood's Index Testaceologicus, suppl., t. 8, f. 6.—REEVE Conch. Icon., f. 11.—SOWERBY, Thes. Conch. v, p. 19, t. 6, f. 40, 41.—WEINKAUFF, Conchyl. Cab., p. 53, t. 21, f. 1.—*H. dentata* JONAS *mss.*, teste Reeve.

This seems to be an exceedingly variable form. Sowerby figures a very different variety (see pl. 19, fig. 11), and says of it: "the flatness of the early growth is very remarkable, and so is the transition of character to be seen in the after-growth." It is probable that this form is the *dentata* of Jonas. A variety resembling this last form is figured by Weinkauff.

H. SQUAMOSA Gray. Pl. 20, fig. 14.

Shell oblong-ovate, transversely obliquely wrinkled, spirally tubularly ribbed, tubercles scale-like, ribs sometimes close, sometimes with a fine ridge running between them; perforations rather large, seven open; exterior spotted and variegated with yellow and orange-brown, interior whitish, iridescent.

An extremely interesting species, well characterized by its close ribs of scale-like tubercles, ranging across the shell in oblique waves; in the middle portion of the shell there is a fine ridge running between the ribs; the color is also peculiar, a kind of burnt-umber-stained orange. (*Reeve.*)

Australia.

H. squamosa GRAY, Appendix to King's Survey of the Intertropical and Western Coasts of Australia ii, p. 494, 1827.—REEVE, Conch. Icon., t. 7, f. 20.—*H. quamosa Gray* (typog. err.), WEINKAUFF Conchyl. Cab., p. 22, t. 3, f. 2.—*H. bistriata* var. *β*, GMELIN.—? *H. Roedingi Chemn.*, MENKE, Zeitschr. f. Mal. 1844, p. 97.

Group of H. midæ.

Characteristic of the South African zoological province. Spiral sculpture is scarcely visible on these shells, but radiating folds or lamellæ are prominently developed. Young shells have a blood-red spot within the cavity of the spire.

H. MIDÆ Linné. Pl. 8, figs. 43, 44.

Shell large, rounded-oval, moderately convex; distance of apex from margin about equaling one-fifth the greatest length of shell; body-whorl strongly angled at the position of the perforations, perpendicularly descending from the angle to the columellar margin,

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surface having strong, elevated, radiating wrinkles or lamellæ, but no spiral markings when adult; perforations 6 to 11, small, subcircular, separated by spaces greater than their own diameter.

The two sides are about equally curved; the convexity varies with age. Color yellowish-gray, the folds usually stained with coral-red. Surface dull, with fine oblique growth-wrinkles and coarse, prominent, less oblique elevated and wavy radiating lamellæ. Spire low, composed of about 3 whorls, the last angulated at the row of perforations. Inside pearly, many-colored, red predominating in young specimens; muscle-scar large, rounded, very rough, especially in old shells, which often have coppery stains inside; columellar plate rather broad (one-seventh to one-tenth the width of shell), sloping inward, its face a little concave; not at all truncated at base. Cavity of spire large, showing about 1½ whorls from below.

Length 138, width 111 mill.; convexity 42 mill.
Length 128, width 102 mill.; convexity 27 mill.
Length 170, width 140 mill.; convexity 45 mill.

Cape region of South America.

H. midæ LINN. Syst. Nat. x, p. 779.—HANLEY, Shells of Linnæus, p. 409.—REEVE, Conch. Icon., f. 16.—SOWB. Thes. Conch. v, p. 31, f. 31.—WEINKAUFF, Conchyl. Cab., p. 7, t. 2, f. 9, t. 3, f. 3.

Belongs to the group of *sanguinea* and *capensis*. It is much larger than the former, with less excentric apex, stronger sculpture and more rounded outline; from *capensis* the different sculpture will separate it.

Var. ELATIOR. Pl. 21, figs. 17, 18, 19, 20, 21.

Shell very deep and bowl-like, the spire more elevated than in typical *H. midæ*. Sculpture of outer surface unknown. Inside light, clouded with red, green and purplish, and having a few olive-brown stains. Muscle-scar large, very rough, extending upon the spiral columella. Peristome produced beyond the body-whorl, free, continuous; the columellar margin wide, sloping strongly inward.

Length 130, width 112, convexity 53 mill.
Length 125, width 110, convexity 56 mill.

I had at first considered these shells a new species, but further study convinced me, after figuring them, that they are merely a small form of *H. midæ*. The specimens are very old and so much

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altered outside by the ravages of a boring sponge that the surface-sculpture cannot be made out.

H. CAPENSIS Dunker. Pl. 50, figs. 6, 7, 8.

Shell when adult very large, thick and heavy, oval, depressed, convex, strongly angled, the left margin very high and perpendicularly descending; back reddish-brown, lighter at the margins, more of a yellowish-red, with whitish streaks showing the places of former peristomes. Sculpture peculiar and irregular; in the young with longitudinal lamellæ which branch or bifurcate; later transverse, becoming thick ribs, cut by the lines of growth, curled and having the appearance of locks of hair, and having the peculiarity of changing their direction with each segment of growth, beginning as longitudinal lamellæ running parallel with the lines of growth, becoming more and more oblique, until next to the lip-edge they stand at right angles to the growth-lines. The striæ being undulating, and the ribs equally so, they assume the appearance of locks. Spire rather high, margined, convex, the part next to the whorl above impressed except on the last whorl where it remains level. The number of holes is uncertain; they are on nodes; 7 to 9 remain open. Inside umbilicated. Impression not distinctly bounded, marked by little pearly prominences arranged somewhat in spiral rows; the nacre is a mingling of silvery-white, rose red and green hues. Columellar margin arcuate, broad, flat, somewhat concave. Length 145, width 114, convexity 40 mill.

Cape of Good Hope.

H. midæ in part, of authors.—*H. capensis* DUNKER, in PHILIPPI, Abbild. u. Beschreib. etc., Haliotis, t. 1, f. 4.—WEINKAUFF in Conchylien Cabinet, p. 23, t. 9, f. 1; t. 10, f. 1, 2.

Agrees with *H. midæ* in size and general form, but differs in sculpture. I have not seen this form. The above description is taken from that of Weinkauff. The young are similar to *H. midæ* in sculpture.

H. SANGUINEA Hanley. Pl. 18, fig. 6.

Shell oblong-ovate, narrowed toward the anterior end, depressed, the distance of apex from margin contained 7 or 8 times in the length of shell; spiral striæ, when visible, very indistinct but with radiating, coarse, oblique folds; perforations 7 to 9.

The left margin is regularly arcuate, the right one straightened, a little concave along the middle part of the outer lip; it is solid but

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rather thin, dark reddish-brown, variegated with blotches of snowy-white, especially in the young; the spire often of a peculiar bronze-red. Surface with a few impressed spiral striæ, often scarcely visible, and low, very irregular undulations or radiating folds, these, too, often subobsolete; it is not strongly carinated at the position of the row of perforations, in adults, and there are several rather strong cords revolving parallel with the holes, between them and the columellar margin. Spire low, composed of about 3 whorls. Inside brilliantly pearly; columellar plate narrow, its edge rounded, convex, sloping outward, obliquely truncated below. Cavity of spire visible from below, rather deep, usually of a beautiful red-bronze color inside.

Length 66, width 40, convexity 18 mill.

Length 71, width 46, convexity 22 mill.

Cape of Good Hope.

H. sanguinea HANLEY, Young Conchologists' Book of Species, p. 60, frontispiece f. 5 (1841).—REEVE, Conch. Icon., f. 17.—SOWB. Thes. Conch. v, p. 93, 94.—WEINKAUFF, Conchyl. Cab., t. 16, f. 3, 4.—*H. ficiformis* MENKE, Zeitschr. f. Mal. 1845, p. 97.—PHIL. Abbild., ii, p. 70, t. 4, f. 3.—*H. spadicea* KRAUSS, *mss.*

The more prominent characters are the peculiar form, narrowed at the anterior end, the reddish or chocolate surface, smooth except for radiating folds, and the coppery-red stain within the cavity of the spire. This last feature is sometimes absent. The perforations are numerous, close together and almost perfectly circular. The columellar shelf or plate slopes outward, is rather narrow and convex on its face. The shell when placed upon a plane surface, rests upon its two extremities, both lips being arched. The apex is nearer to the margin than in either *H. midæ* or *H. capensis*, the two Cape species with which this one agrees in lacking spiral striation.

H. MULTIPERFORATA Reeve. Pl. 6, fig. 36.

Shell oblong-ovate, rather flexuous, spiral portion of the whorls somewhat elevated; spirally linearly grooved, grooves a little waved, irregular; holes rather small, numerous, ten open; exterior dark brown, varigated with green, interior whitish.

This darkly variegated species, the surface of which is smooth, engraved with fine waved spiral lines, has somewhat the form of the *H. sanguinea;* the spiral portion of the shell being more than usually raised. The holes are numerous and close-set. (*Reeve.*)

Habitat unknown.

H. multiperforata RVE. Conch. Icon., t. 9, f. 15, 1846.

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Group of H. nævosa.

These shells are flat, rounded, the spire more than usually central. They form a transition to the section *Padollus*.

H. CUNNINGHAMI Gray. Pl. 7, fig. 38.

Shell very large, rounded-oval, flattened and disc-shaped; distance of apex from margin something *more than one-fourth* the length of shell.

The outline is more orbicular than in *H. nævosa*, and flatter. The right side is less curved than the left. The perforations stand upon a carina. It is a solid shell. The specimen before me is dull red, with obliquely radiating revolving flames of whitish-yellow on the earlier part of the body-whorl. (Reeve describes it as "reddish-brown, variegated with green and darker brown." Philippi says the coloration is a marbling of large spots of pale green, whitish, brownish-red and dark reddish-brown, the brownish-red predominating.) On the earlier portion the surface is finely spirally striated, but this sculpture becomes obsolete upon the greater portion of the body-whorl, giving place to coarse wrinkles of growth. There are also low radiating waves or folds in places. The spire is not much elevated. Inside it is light, very iridescent, red and silvery predominating. Columellar ledge or plate flat, broad, obliquely truncated below, of about equal width all around. Cavity of spire large, very broad, shallow. Number of open perforations very variable; usually 7 in young shells, about 5 or 6 in adults, very old individuals having 4.

Length 190, width 155, convexity 35 mill.

Australia.

H. cunninghami GRAY, in appendix to King's Voyage ii, p. 494. —REEVE, Conch. Icon., f. 3.—SOWERBY Thes. Conch. v, p. 30, f. 36.—WEINKAUFF, Conchyl. Cab., p. 25, t. 10, 11.—*H. nævosa* DESH. in LAM., An. s. Vert. ix, p. 34, excl. syn.—PHILIPPI, Abbild. u. Beschreib. i, t. 2, 3 (not *nævosa* Martyn).—*H. gigantea* MKE., Spec. Moll. Nov. Holl., p. 31 (not of Chemnitz).

A magnificent species, very large and flat, the apex more central than in the allied *H. nævosa*, and the cavity of the spire consequently wider. The disc is covered with fine spiral striæ, but in old individuals these become obscure.

H. NÆVOSA Martyn. Pl. 11, figs. 56, 60; pl. 5, fig. 26.

Shell large, rounded-oval, much depressed, the distance of apex from margin one-fifth the length of shell; sculptured with fine spiral

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cords cut by close minute striæ of increment, and having radiating waves or folds above; a slight angle at the row of perforations, below it broadly excavated and then carinated; perforations about 6, elevated, circular.

The outline is suborbicular, much depressed; solid but not thick; surface either dark red with few radiating angular white patches, or dull red and green, streaked and mottled. The spiral cords of the outer surface are either nearly equal, or have slightly larger ones at wide intervals; they are decussated by close growth-striæ. Whorls a trifle over 3. Inside corrugated like the outer surface, silvery, very brilliantly iridescent, the reflections chiefly sea-green and red. Columellar plate broad, flat, obliquely truncated at base. Cavity of spire wide, open, but shallow.

Length 120, width 90, convexity 28 mill.

Australia.

H. nævosa MARTYN, Univ. Conch., t. 63.—REEVE, Conch. Icon., f. 27 *a*, *b*, *c*.—SOWERBY Thes. Conch. v, t. 10, f. 73.—WEINKAUFF, Conchyl. Cab., p. 34, t. 14, f. 1, 2, 3.—*H. clathrata* REEVE, Conch. Icon., f. 72.—SOWERBY, Thes. Conch. v, t. 6, f. 39.

This is a variable form, in color varying from dark coral red to dull red streaked with pale green. The young have been re-named *H. clathrata* by Reeve (see pl. 5, fig. 26).

Reeve gives the localities Tasmania, New Zealand and Bohol, Philippines, in addition to Australia. The Philippine Island locality is for *clathrata*.

H. ROEI Gray. Pl. 18, fig. 1; pl. 48, figs. 11, 12, 13.

Shell short-oval, distance of apex from nearest margin somewhat over one-fifth the greatest length of shell; sculpture consisting of strong unequal spiral cords crossed by radiating folds. Perforations 7 to 9, nearly circular, rather small.

The right side is straighter than the rounded left margin, and the back depressed; color scarlet-red, more or less marbled with olive-green, painted with broad white rays. The spiral riblets are numerous, unequal, separated by deeply cut grooves, their summits cut by fine radiating striæ; they are further rendered uneven by more or less developed folds radiating from the suture. The spire is rather elevated. Inside silvery, very iridescent, with pink, green and steel-

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blue reflections. Columellar plate narrow, obliquely truncated at its base. Perforations a little raised, numerous.

Length 75, width 58, convexity 23 mill.

West Coast of Australia.

H. Roei GRAY, King's Voy., vol. ii, appendix, p. 493.—REEVE, Conch. Icon., t. 4, f. 10.—SOWB., Thes. Conch. v, f. 77, 78.—WEINKAUFF, Conchyl. Cab., p. 37, t. 15, f. 4–6.—*H. scabricosta*, MENKE, Moll. Nov. Holl. Spec., p. 31.—PHILIPPI, Abbild. u. Beschreib. i, p. 120, t. 1, f. 6.—*H. Hargravesi* COX, Proc. Zool. Soc. Lond. 1869, p. 49, t. 26, f. 4.

The orbicular form, and knotted spiral cords separated by deep grooves are characteristic. The columella is rather narrower than usual.

The specimen before me is half-grown, like the figures on pl. 48, representing the *H. scabricosta*. *H. Hargravesi* is a still younger shell.

H. SULCOSA Philippi. Pl. 48, figs. 17, 18, 19.

Shell suborbicular, rather depressed, reddish; having about 30 squamose ribs above; spire moderately large, a little prominent; perforations very small. Inside white, pearly, scarcely sulcated.

The thirty riblets between the suture and the holes, as well as the six riblets between holes and columellar margin are made almost scaly by close elevated growth-lines. They are much more numerous and less raised than in *H. scabricosta*. The color of the back is reddish-brown, tending toward gray. The inside is not furrowed as in other species, and has a silvery-white nacre with a few brown spots. The holes are much smaller than in *H. scabricosta*, and it is more convex. (*Phil.*)

Australia.

H. sulcosa PHIL. Zeitschr. f. Mal. 1845, p. 150; Abbild. u. Beschreib. ii, p. 157, t. 6, f. 2*a*, *b*, *c*.

H. COCCORADIATA Reeve. Pl. 4, figs. 16, 20.

Shell oval, depressed, distance of apex from margin about one-sixth the length of shell; spirally striate, decussated by closer, finer growth-striæ; perforations 6; color yellowish or olive, with irregular radiating stripes of vivid scarlet.

The shell is rather small, right margin decidedly less convex than the left; upper surface depressed, flattened, and having a spiral depression around the middle of the body-whorl; rather thin; radiately

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striped with scarlet, and in the specimen before me the closed perforations are scarlet; spire pink. Surface having numerous unequal spiral threads, decussated by distinct, close growth-striæ, as in *H. rosacea;* there are also inconspicuous short folds radiating from the suture on the earlier portion of the body-whorl, and just outside of the median spiral depression on the body. Inside bright silvery, with green and red reflections, the nacre having spiral folds. Columellar plate flat but rather narrow, obliquely subtruncate at base. Cavity of spire visible. Peforations 6, nearly circular, separated by spaces about as wide as the holes.

Length 42, width 29, convexity 8 mill.

Australia.

H. cocco-radiata REEVE, Conch. Icon., f. 46 (1846).—WEINKAUFF, Conchyl. Cab., t. 23, f. 3, 4.

The decussated sculpture, scarlet markings, etc., are characteristic. The cavity of the spire is wholly visible, not concealed as it is in *H. rosacea;* and the columellar plate is rather narrow. The figure of the interior of this species (fig. 16) has been united with the exterior view of *H. cruenta* by the artist. The smaller size separates the species from *H. nævosa*, which is closely allied.

H. LAUTA Reeve. Pl. 3, fig. 8.

Shell ovate, anteriorly attenuated, undately swollen, spirally ridged, ridges very fine, close-set, decussated with minute striæ, perforations rather large, five open. Irregularly marbled with red and yellowish-white. (*Reeve.*)

Swan River, Australia.

H. lauta Reeve, Conch. Icon., t. 17, f. 68, 1846.

Group of H. excavata.

H. excavata stands in that neutral borderland which forms a sort of Alsace and Loraine between Haliotis proper and Padollus. Like the group of *H. nævosa*, which also occupies this debatable territory, the *H. excavata* has been from time to time annexed to one or the other group, according to the fancy of systematists mapping these regions.

H. EXCAVATA Lamarck. Pl. 9, fig. 51; pl. 49, fig. 23.

Shell nearly circular in outline, elevated, somewhat turbinate, the distance of apex from margin between one-third and one-fourth the greater diameter of the shell. Body-whorl rounded, convex above;

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surface covered with spiral cords and threads, and having numerous folds radiating from the suture. Perforations 5, oval, not raised.

The shell is nearly circular, very convex, the spire decidedly elevated, formed of about three rounded whorls; the last whorl has a blunt keel at the row of holes, and a narrower, more acute carina a short distance below it, the space between being a little concave. The entire surface has close spiral cords and threads which are sometimes somewhat granose, and there are numerous folds radiating from the suture, but not long enough to reach the periphery.

The coloration consists of broad radiating patches or oblique stripes of chestnut-brown, green and flesh-color or whitish. Inside it is silvery with red and green reflections; muscle-impression not distinct. Columellar plate flat, not truncate below, strongly sloping inward. Perforations generally 5, oval, their edges only a trifle raised. Length 68, width 56, convexity 26 mill.

Australia.

H. excavata LAMARCK, An. s. Vert. vi, p. 215.—REEVE Conch. Icon., f. 25.—SOWERBY, Thes. Conch. v, t. 3, f. 21, 26.—WEINKAUFF, Conchyl. Cab., p. 39, t. 16, f. 1, 2.

The elevated spiral tendency is stronger in this species than in other *Haliotis*. It is possibly more nearly allied to the little *H. pulcherrima* than to other species.

✓ Section PADOLLUS Montfort, 1810.

Scarcely separable from the *nævosa* group of *Haliotis* being connected by numerous intermediate species. It is convenient, however, to recognize the small rounded species by this term. Australia is the center of distribution; but a species is found on the South African coast, one off the Galapagos (singularly close in characters to the S. African), and *H. ovina* is reported from as far north as China.

They fall into four groups; see synopsis *antea*, page 78.

Group of H. parva.

Spirally striated; no radiating lamellæ between the spire and the inner spiral rib, ... *parva; pourtalesii.*

Spirally striated; having raised lamellæ between spire and the inner spiral rib, ... *emmæ; tricostalis.*

H. PARVA Linné. Pl. 14, fig. 74.

Shell rather small, oval, depressed, having a strong rounded rib on the upper surface parallel with the row of holes; the surface all

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over covered with fine closer spiral threads and much finer radiating striæ; perforations 6.

The form varies from elliptical to rounded-oval; the spiral rib of the upper surface is also variable in prominence. There are no radiating lamellæ between the spire and the rib, and as usual there is a shallow channel outside of the row of holes. The color is between scarlet and brick-red, with irregular, often radiating white patches. The spire is raised and rather prominent. Inside silvery, with red and green reflections; having a furrow corresponding to the rib of the outside. Columellar shelf narrow, flattened. Holes subcircular, 6 open.

Length 47, width 34, convexity 10 mill.

Length 40, width 29, convexity 9 mill.

Cape of Good Hope.

H. parva LINN. Syst. Nat. x, p. 780.—HANLEY, Ipsa Linn. Conch., p. 413.—REEVE, Conch. Icon., f. 53a, b.—KRAUSS, Die Südaf Moll., p. 94.—WEINKAUFF, Conchyl. Cab., p. 8, t. 2, f. 11.—*Sulculus parvus* ADS.—*Haliotis canaliculata* LAM. Anim. s. Vert. vi, p. 217. —And of DESHAYES and BLAINVILLE.—*Padollus canaliculatus* CHENU, Manuel, f. 2748, 2749.—*H. vulgaris* BLAINVILLE, Mal. pl. de princ. no. 2, f. 6.—*H. carinata* SWAINS, in Bligh Catal., appendix. p. 2.

Distinguished by the fine even spiral striation, the strong central rib, and the entire lack of radiating folds or lamellæ.

H. POURTALESII Dall. Pl. 22, figs. 27, 28.

Shell small, of a pale brick-red color, with white dots on some of the spirals, rather elevated, with about two and a half whorls; apex small, prominent; holes about twenty-five, of which five remain open, the margins of these rather prominent; outside the row of holes the usual sulcus is strongly marked; about midway from the suture to the lines of holes is a raised rib, rather obscure, but differing in different individuals and corresponding to an internal sulcus; between the central ridges and the suture there are no undulations or transverse ridges of consequence; sculpture of well marked, rather flattish, spiral, close-set threads, sometimes with a single finer intercalary thread, overlaid by smaller rather compressed transverse ridges, in harmony with the incremental lines; on top of the spirals the ridges bulge like the threads of worsted on canvas embroidery; spire situated well forward and with subvertical

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sides; interior pearly, the coil of the spire rather close and the margin of the pillar flattened.

Longitude of shell, 23; latitude, 18; altitude, 11·5; nucleus behind the anterior end, 17 mill. (*Dall.*)

The nearest relative of this shell is *H. parva*, from the Cape of Good Hope, which differs from our specimens chiefly in the greater prominence of the central rib, and in being a little more circular in outline.

The shell from the Galapagos agrees so exactly with what we know of *H. Pourtalesii* and with my own recollection of the type specimen destroyed in the Chicago fire, that I am unwilling to separate it, though the distance between the two localities is so great. (*Dall.*)

Near Charles Island, of the Galapagos group, in the Pacific. (In 33 fms., sand.)

H. Pourtalesii DALL, Rep. on Albatross Moll., in Proc. U. S. Nat. Mus. xii, p. 355, t. 12, f. 1, 3, 1889.—*? H. pourtalesii* DALL. Bull. Mus. Comp. Zool. ix, p. 79, 1881; xviii, p. 395, 1889.

A species of *Haliotis* believed by Dr. Dall to be the same as the one above described was dredged near the Florida Reefs, in 200 fms., from the bed of the Gulf Stream by Pourtalès, March 31st, 1869. The specimen contained the animal. It was destroyed in the great fire of 1871 in Chicago, together with the entire collections of Pourtalès and Stimpson. No specimens of Haliotis have been found since in the West Atlantic or Gulf.

H. EMMÆ Gray. Pl. 14, fig. 75; pl. 49, figs. 27, 28, 29.

Shell rounded, ovate-depressed, having a low convexity (scarcely a rib) on the upper surface parallel with the row of holes, and numerous lamellæ radiating from the spire; sculptured throughout with fine spiral cords; open holes 6.

The form is short oval, right margin straighter than the left. The upper surface has a low wide spiral rib with oblique undulations or folds upon it which take the direction of tangents from the spire; and between this and the spire there are numerous radiating raised lamellæ like pinched-up folds taking the direction of growth-striæ. The entire surface has acute growth-striæ, appearing as little scales on the fine rounded spiral cords. There is a channel outside of the row of holes. The color is a beautiful orange-red, with wide rays of lighter; outside of the row of holes there are

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numerous descending stripes alternately darker and lighter. Inside silvery, sculptured to correspond with the spiral and radiating ribs of the outside, iridescent. Columellar shelf narrow, flat. Perforations low-tubular, about 6 open.

Length 47, width 34, convexity 10 mill.

Length 90, width 70 mill. (Reeve's figure.)

Australia.

H. emmæ GRAY in REEVE, Conchol. Icon., t. 10, f. 29.—SOWERBY, Thes. Conch. v, t. 2, f. 16.—WEINKAUFF, Conchyl. Cab., p. 56, t. 22, f. 1, 2.

The specimen described above and figured on pl. 49, figs. 27–29, is much smaller than that figured by Reeve. The species is intermediate between *H. parva* and *H. tricostalis*, having the general appearance and color of the first, but agreeing with the last-named in having radiating lamellæ or folds.

H. TRICOSTALIS Lamarck. Pl. 16, figs. 84, 85.

Shell rounded-oval, depressed, having a strong spiral rib on each side of the row of perforations, and prominent elevated radiating lamellæ around the spire; 5 to 6 open perforations.

The shell is moderately large but thin, of the depressed, irregularly oval shape common to all Padollus. Color "reddish or variegated olive and green." Surface having a strong rounded ridge inside of the row of elevated tubular holes, and a smaller, nodose ridge outside of it; above finely striated spirally, and with coarse raised lamellæ between the spire and the inner spiral rib. Inside it is silvery and very iridescent, with excavations corresponding to the elevations of the outer surface. The columellar plate is narrow, obliquely truncated below. Perforations tubular, 5 or 6 open.

Length 74, width 53 mill.

Australia; Java.

H. tricostalis LAMARCK, Anim. s. Vert. vi, p. 218.—DESH. in Lam., ed. 2, ix, p. 30.—WEINKAUFF, Conchylien Cabinet, p. 13, t. 5, f. 3, 4.—*Padollus rubicundus* MONTFORT, Conch. Syst., p. 114, 115 (*very doubtful!*).—*H. rubicundus Lam.*, REEVE, Conch. Icon., f. 5.—*H. canaliculata* SCHUBERT & WAGNER, Fortsetz. des Conch. Cab. xii, p. 177, t. 224, f. 3088, 3089.—*Padollus tricostalis* H. & A. AD., Genera, p. 443, t. 15, f. 7.—CHENU, Manuel i, f. 2746, 2747.

Easily known by its three spiral ribs and the radiating lamellæ above.

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Group of H. pulcherrima.

H. PULCHERRIMA Martyn. Pl. 13, fig. 69.

Shell small rounded-oval, flattened; distance of apex from margin about one-fourth the length of shell; surface finely corrugated by radiating deep folds. Perforations generally 8, small, round, tubular; the row bordered on each side by a shallow channel.

This little shell is straighter on the right than on the left margin. The color is whitish or flesh-colored with broad oblique red rays. The surface is finely corrugated, the folds strong, close and numerous, not extending quite to the row of holes; their summits are crenulated by inconspicuous spiral striæ. Outside of the row of holes the surface slopes flatly to the strong angle or carina at the columellar margin; and the descending folds on this portion are cut into granules by spiral striæ. The spire is somewhat elevated. Inside it is silvery. The columellar shelf is flat, rather wide.

Length 27, width 21, convexity 7 mill.

Length 26, width 20, convexity 9 mill,

Paumotus; Lord Hoods Island; and S. Australia.

H. pulcherrima MARTYN, Univ. Conch., t. 62.—CHEMNITZ, Conchyl. Cab. x, p. 313, f. 1605, 1606.—REEVE, Conch. Icon., f. 1.—MARTENS & LANGKAVEL, Donum Bismarkianum, p. 49.—WEINKAUFF, Conchyl. Cab., p. 16, t. 6, f. 7, 8.

A beautiful little shell, with finely corrugated surface.

Group of H. ovina.

H. OVINA Chemnitz. Pl. 19, figs. 7, 8.

Shell rounded-oval, depressed, distance of apex from margin a little less than one-fourth the length of shell; perforations tubular, elevated; upper surface with strong radiating folds; green or reddish, radiately painted with white; inside silvery; columellar plate flat, very wide.

The shell is rounded-oval, quite flat; the whorls of the spire having a corona of tubercles; the last whorl has radiating folds sometimes ending in a series of knobs around the middle of the upper surface; some trace of fine spiral cords may usually be seen near the lip. The elevated tubular perforations are situated upon a low keel; below this there is a depression and then another keel at the periphery, upon which there are several granose spiral cords. The color is ochraceous-pink with broad radiating patches of white,

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which have reddish dots scattered in them and along their edges. Sometimes a beautiful shade of green replaces the reddish. It is silvery inside, and corrugated by the folds of the outer surface. The columellar plate is flat and exceptionally broad. The cavity of the spire is large. Perforations four or five, circular, tubular.

Length 58, width 43, convexity 13 mill.

Length 64, width 47, convexity 15 mill.

Australia; Philippines; Navigators Is.; Liu-Kiu Is.

H. ovina CHEM. Syst. Conchyl. Cab. x, p. 315, t. 166, f. 1609.—GMELIN, in Linné, Syst. Nat. xiii, p. 3691.—REEVE, Conch. Icon., f. 23.—PHILIPPI, Abbild. u. Beschreib. iii, t. 9, f. 3.—WEINKAUFF, Conchyl. Cab., p. 18, t. 6, f. 11.—*H. latilabris* PHIL. Abbild u. Beschreib. t. 9, f. 5.

A beautiful shell, either ochery-reddish or of a darker olive-green hue, having radiating patches of white. The radiating folds of the upper surface are most prominent around the middle of the last whorl. The perforations are erect and tubular. The green variety was called *H. latilabris* by Philippi.

Group of H. brazieri.

H. BRAZIERI Angas. Pl. 13, figs. 67, 68.

Shell small, rounded oval, flattened; surface smooth except for a strong rounded rib revolving midway between the spire and the row of perforations, and fine, hair-like growth-striæ all over; the perforations are round, erect, tubular, 4 to 6 in number. Color red, variegated with olive-green.

The shell is about the form of *H. pulcherrima* but flatter, without radiating folds or spiral striæ except for indistinct indications on the spire; a close inspection shows close fine radiating striæ all over. The surface between the holes and the columella is strongly convex. One of the specimens before me is flesh-colored, the other blood-red; both are curiously variegated with a few zigzag green markings above, and outside of the row of holes there are numerous short flames extending toward the columella. Inside it is silvery-pinkish. The columellar plate is not wide; it is flat. The cavity of the spire is red inside. Length 30, width 22, convexity 8 mill.

Bottle & Glass Rocks, Port Jackson; Vancluse Point; and Macquerie Lake, Australia.

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H. brazieri ANGAS, Proc. Zool. Soc. Lond. 1869, p. 45, t. 2, f. 1. —SOWERBY, Thes. Conch. v, t. 6, f. 43; t. 14, f. 114.—WEINKAUFF Conchyl. Cab., p. 77, t. 29, f. 4.

A handsome little species, smooth except for fine growth-striæ and a more or less conspicuous spiral rib midway of the body-whorl. The perforations are round and tubular, as usual in the subgenus *Padollus*.

Section TEINOTIS H. & A. Adams, 1858.

Teinotis H. & A. AD. Genera Recent Moll. i, p. 442.—*Tinotis* FISCHER.

The shell is over twice as long as broad in *Teinotis*, and the foot is correspondingly elongated. It projects more posteriorly than in the rounder species of *Haliotis*. Like the others, this species has a developed operculigerous lobe; with a deep longitudinal central furrow.

H. ASININA Linné. Pl. 14, fig. 76.

Shell oblong or kidney-shaped, over twice as long as wide; spire subterminal; surface nearly smooth; open holes five to seven.

This is an elongated species, convex; either greenish or flesh-colored, with triangular brown markings. The surface is almost smooth, polished; the spire has narrow spiral threads, 6 above, 2 below the row of holes; these threads are separated, and composed of tiny beads, brilliant colored, usually alternately orange, robin's-egg blue and yellow or white; the surface between holes and columella is convex, and has five or six smooth spiral threads. The spire is composed of 3 whorls; it is rather elevated. Inside silvery, beautifully iridescent; columellar plate wide, sloping outward. Holes oblong, their edges not raised.

Length 80, width 37, convexity 12 mill.

Japan; China; E. Indies; Australia.

H. asinina LINN., Syst. Nat. x, p. 780, and of authors.

A species like no other in form. There is considerable variation in color. The spiral dotted threads of the spire are also unique.

Unidentified Species of Haliotis.

H. SEMIPLICATA Menke, Moll. Nov. Holl. Specim. p. 32.

H. ROTUNDATA and SINUATA Perry, Conchology, pl. 52, figs. 1, 2, 1811.

H. CRENATA Swainson, Bligh Catal. p. 3.

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Family *SCUTELLINIDÆ* Dall.

Shell ovate, depressed-conical, surface with radiating sculpture or cancellated; apex posterior and submarginal; muscle-impression horse-shoe-shaped, open in front.

The dentition is purely rhipidoglossate, resembling that of *Neritina* and *Helicina*. The gill is situated like that of *Neritina* or *Acmæa*, on the left side above the body, and pointed to the right over the back of the neck. The anal papilla and that by which the products of the renal organ are ejected, are situated exactly as in Acmæa. The tentacles are long and slender, the eyes well-developed and placed on swellings at the outer posterior part of the tentacles. The distal end of the muzzle is expanded, semilunar, smooth, with a continuous margin a little produced at the outer corners. The mouth is small and situated in the center of the disk. The dental formula (for a half-row) is 1. (1. 2. 1.). ∞ . The rhachidian tooth is flat, squarish, and edentulous, as in *Helicina orbiculata*.

Shells of this family may be known from *Patellidæ* and *Acmæidæ* by the *posterior position of the apex*, which is directed away from the opening in the horse-shoe-shaped muscle-scar, while in the families mentioned the apex is more or less anterior, at the same end that the muscle of attachment is open. *Broderipia* has a very similar shell, but it is pearly inside, while *Scutellina* is not. Anatomical characters as well as the limpet-like shell seem to throw the three families *Scutellinidæ*, *Addisoniidæ* and *Cocculinidæ* into proximity; but there are other features sufficiently isolating each. It must be understood that their natural position is by no means between *Haliotidæ* and *Fissurellidæ*,—families with which these little limpets have no especial affinity.

According to Dall, there is no relic of epipodium nor any intromittent organ in the specimen of *S. antillarum* described by him, which may have been, however, a female. The margin of the mantle has a minute fringe of papillæ.

Genus SCUTELLINA Gray, 1847.

Scutellina Gray, P. Z. S. 1847, p. 168 (type *S. crenulata* Brod.). —Dall, Amer. Journ. Conch. vi, p. 236.—H. & A. Ad. Gen. Rec. Moll. i, p. 460.—Dall, Bull. M. C. Z. xviii, p. 342, 1889.—*Scutella* Brod. P. Z. S. 1834, p. 47 (not of Lamarck).

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For characters see above. This is a small group of shells very like *Acmæa* in appearance, but having the apex back of the center, as usual in limpet-like rhipidoglossa, and having the lingual dentition distinctly rhipidoglossate in character. The following list of species must be regarded as provisional, as the soft parts of most of them are unknown.

S. CRENULATA Broderip. Pl. 46, fig. 6.

Shell subconical, concellated, with sharp radiating striæ; white; shining inside; marginal ring and margin crenulated. Length ¾, width ⅝, alt. ½ inch. This shell was found dead on coral sand on the beach of the island at a distance from any fresh-water. The marginal ring is very strongly developed, and the margin itself is not even; for when the shell is placed with the aperture downwards on a flat surface, it rests on the two ends, the sides of the margin forming a low arch. (*Brod.*)

Chain Island, S. Pacific.

Scutella crenulata BROD., Proc. Zool. Soc. 1834, p. 48.

S. CINNAMOMEA Gould. Pl. 46, figs. 8, 9, 10, 11.

Shell small, thin, oval, convexly arched, of an intense cinnamon-color within and without. The apex is acute, projecting even beyond the anterior margin and nearly touching it, so that the apex is far below the most elevated point of the shell, which is nearly central. Surface covered with minute very numerous radiating striæ, which are rough with crowded points that are very slightly vaulted. The aperture is an elongated oval, the margin minutely crenulated, and at the anterior portion broadly excurved and strengthened within by a white marginal rib, causing the interior to resemble a *Navicella*. (*Gld.*) Length ½, breadth ⅜, alt. $\frac{9}{40}$ inch.

New South Wales.

Patella cinnamomea GLD., Proc. Bost. Soc. N. H. ii, p. 151, 1846;—Exped. Sh., p. 9; U. S. Expl. Exped., p. 345, f. 449, a, b.—ANGAS, Proc. Zool. Soc. Lond. 1871, p. 97.

According to Mr. Angas, the *S. ferruginea* of Adams is synonymous.

S. PULCHELLA Lischke. Pl. 46, figs. 4, 5.

Shell small, thin, more or less equally arched, elliptical, inequilateral, yellowish, cancellated with very close radiating unequal riblets and dense subundulating interrupted concentric lirulæ; riblets sculptured with very fine erect scales; apex curved, obtuse, terminal. Length 8½, width 5½, alt. 4 mill.

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MANUAL

OF

CONCHOLOGY;

STRUCTURAL AND SYSTEMATIC.

WITH ILLUSTRATIONS OF THE SPECIES.

BY GEORGE W. TRYON, JR.

CONTINUATION BY

H. A. PILSBRY,

CONSERVATOR OF THE CONCHOLOGICAL SECTION OF THE ACADEMY OF NATURAL SCIENCES OF PHILADELPHIA.

Part 47-Plain

PHILADELPHIA:

Published by Conchological Section,

ACADEMY OF NATURAL SCIENCES,

OF PHILADELPHIA.

Dec. 16, 1890.

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This species of which three specimens lie before me, is elliptical, thin, yellowish. The example of which measurements are given above is very high in the back, the sides rather steeply sloping; the others, although of the same size (length 8, breadth 5–5½ mill.), are less convex, only 3 mill. high, and more regular. The blunt curved apex is over the posterior margin in the more convex example, in the others very near to it. The apex is not exactly in the middle laterally, but a little to the left of it; the shell consequently is inequilateral. The sculpture consists of fine, close radial riblets of unequal size, and similar transverse cords, forming erect scales where they intersect the radials. These last cords are short and irregularly placed, running often over several radial ribs and their interstices, not forming concentric lines, but merely interrupted wavy lines. The inner margin is scarcely noticeably crenulated and is sloping all around. (*Lischke.*)

Nagasaki, Japan.

S. pulchella LISCHKE, Mal. Bl. xviii, p. 41, Jan. 1871; Jap. Meeres-Conchyl. ii, p. 100, t. 6, f. 20–23.

S. UNGUIFORMIS Gould.

Shell small, white, lucid, rounded-elliptical, depressed, arched, apex minute, deflexed; outside decussated by concentric and radiating most minute striæ, gemmulate toward the apex. Length 6, width 5, alt. 1 mill. (*Gld.* in Proc. Bost. Soc. N. H. vii, p. 162.)

Kagosima.

S. SCOBINATA Gould.

Shell small, cinnamon colored, rounded-ovate, much elevated; apex terminal, deflexed; outside ornamented with concentric undulations and extremely close radiating striæ, and roughened by irregular, elongated, oblique granules; inside subnacreous.

Length 8, width 7, alt. 4 mill. (*Gld.* l. c., p. 162.)

Oosima

S. CANCELLATA Pease.

Shell oval, somewhat conical; surface cancellated by fine radiating ribs and concentric raised striæ; apex extending to the posterior margin. Color white. (*Pease* in P. Z. S. 1860, p. 437.)

Sandwich Is.

S. COMPRESSA Pease. Pl. 46, fig. 3.

Shell oblong-ovate, posteriorly elevated and compressed laterally, radiately ribbed, ribs small, regular, close and somewhat wrinkled,

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transversely, minutely elevately striate. Yellowish red, margins yellowish. (*Pse.*) Length 5. diam. 3 mill.

Tahiti.

S. compressa, PSE., Amer. Journ. Conch. iv, p. 99, 1868.

S. GRANOCOSTATA Pease.

Shell oval, white, radiately granosely ribbed, granules rounded, transversely, minutely elevately striate; apex posterior, extending to the margin. (*Pse.* l. c., p. 100.) Length 7½, width 6 mill.

Hawaii.

S. ACULEATA Pease.

Shell orbicular, elevated, covered with small prickly nodules and very finely decussated with raised striæ, concentrically ridged toward the apex; apex posterior, not extending to the margin. Yellowish, apex reddish. (*Pse.* l. c., p. 100.)

Hawaii.

S. ANTILLARUM Shuttleworth.

The shell, the only Scutellina I have seen from the Gulf or Antilles I suppose to be Shuttleworth's species. It is a small thin shell, about 8 by 6 mm. at the base, and 3·0 mm. high. The apex is situated in the posterior fourth of the length, and has a minute dextral half-immersed spiral nucleus, whose extent is marked by a slight contraction where the conical shell begins. The anterior slope is prettily and evenly arched, the posterior slope steep and concave beneath the apex. The surface is of a brownish straw-color, the interior subtranslucent white of brilliant polish but not nacreous. The sculpture is of very numerous, fine, radiating raised lines, with minute spines or vaulted scales closely set upon them, giving a rasp-like surface; there are no regular concentric lines, but only occasional lines of growth.

I have described it thus fully as I suspect Shuttleworth's name is a mere catalogue name which has never been validated by a description or figure. At least, after very full search I have failed to find any description or reference to a description. It is not the Patella (Acmæa) antillarum of Sowerby and Philippi.

S. antillarum Shutt., DALL, Blake Gastrop. in Bull. M. C. Z. xviii, p. 342.—? *S. antillarum Shutt.*, POULSEN, Cat. of W. Ind. Shells, p. 14, 1878.

S. FERRUGINEA, (pl. 46, figs. 2, 2.) ASPERULATA, COSTATA, ELONGATA, GALATHEA, GRANULOSA, LÆVICOSTALIS of A. Adams

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and S. ARABICA Rüpp. are species enumerated in the *Genera of Recent Mollusca*, but of which I have not seen descriptions.

Family COCCULINIDÆ Dall, 1882.

Shell patelliform, not nacreous, symmetrical, with an entire non-sinuated margin and a posteriorly inclined apex with a (usually deciduous) spiral nucleus; muscular impression horse-shoe-shaped, interrupted over the head.

Animal with a prominent head and muzzle, the males with an intromittent organ at the base of the right tentacle; a single lamellose asymmetrical gill (resembling in form and place of attachment the gill in Acmæa) between the under surface of the mantle and the upper surface of the body from a point above and behind the head, extending around toward the right, and even backward on the right side; attached only at its base. Eyes wanting in the known species. Anus anterior, opening in a papilla above and behind the head. Mantle margin and sides of foot plain, without epipodial papillæ or processes, but they are sometimes present behind. Radula with a small or moderate hardly raised rhachidian tooth (the cusp in one species obsolete), three moderate inner laterals with denticulate cusps, a larger denticulate major lateral with a stout and twisted stalk, and on each side a stout base from which spring numerous slender uncini hooked at their tips. There is no jaw. The dentition resembles in a general way that of Parmophorus and of some species of Helicina.

Genus COCCULINA Dall, 1882.

Cocculina DALL Proc. U. S. Nat. Mus. 1881, p. 402; Blake Report in Bull. M. C. Z., vol. xviii, 1889, p. 345.—VERRILL, Trans. Conn. Acad. v, p. 533; vi, p. 202.—JEFFREYS, P. Z. S. 1883, p. 393.—FISCHER, Manuel de Conch., p. 841.—WATSON, Challenger Gasterop., p. 30.—*Tectura* sp. JEFFREYS, P. Z. S. 1882, p. 672.

The animal is blind; the shell colorless, with radiating and concentric sculpture; other characters are given in the diagnosis of the family. About a dozen species are known, one from the Philippines, the others from the Atlantic. All are deep-sea forms. Dr. Dall divides the genus into two sections: COCCULINA *s. s.*, foot having two posterior epipodial filaments, and COCCOPYGIA, foot without epipodial filaments. The last-named section contains *C. spinigera* Jeffr.

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C. RATHBUNI Dall. Pl. 25, figs. 5, 6.

Shell white, depressed, the slopes flattened, sides subparallel, with slight radiating and concentric sculpture and a subcentral apex from which the nucleus is usually lost, leaving a little scar on the shell. Length 10–13 mill.

Shell depressed, white, thin, with sides nearly parallel and their slopes lightly flattened, and with ends similarly broadly rounded; sculpture of faint closely (but irregularly) set grooves radiating from a smooth apex (which has originally a subspiral nucleus), and crossed by concentric growth lines, which are more or less irregular in different individuals; faint yellowish areas seem to indicate a thin, very closely adherent epidermis; apex prominent, more or less incurved and slightly laterally compressed, usually showing a scar where the embryonic nucleus was attached; inside polished or smooth. (*Dall.*)

Length 11, breadth 6·5, height 2·75 mill.

Another dead specimen is three times larger.

100 *miles S. and E. from Martha's Vineyard* in 506 fms.; *Off Barbados* in 399 fms.; *off St. Vincent* in 464 fms.; *off Martinique* in 502½ fms.

C. Rathbuni DALL, Proc. U. S. Nat. Mus. 1881, p. 402 (1882); Blake Gastrop., 347, t. 25, f. 5, 7, 7a.—VERRILL, Trans. Conn. Acad. v, p. 534.

C. BEANII Dall. Pl. 25, figs. 23, 24.

Shell elevated, white, the anterior slope much the longer and conspicuously arched, the posterior slope excavated concavely, the apex elevated, subposterior and much incurved, the nucleus generally gone in adults, leaving a little scar; sculpture stronger and more distinctly cancellated in some specimens than in C. Rathbuni. The young are more sharply sculptured than the old, and at the intersections the riblets are nodulous or even slightly spinose, the shell is smaller than in C. Rathbuni. (*Dall.*)

Length 8, breadth 5, height 4 mill.

79 *miles S. of Martha's Vineyard*, in 100 fms.; *also in the West Indies off Barbados, Martinique, Guadelupe and St. Vincent*, in 399 to 583 fms.

C. Beanii DALL, Proc. U. S. Nat Mus. 1881; p. 403 (April, 1882); Blake Gastrop., p. 347, t. 25, f. 2, 4, 8.—VERRILL, Trans. Conn. Acad. v, p. 533.

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C. ADUNCA Jeffreys. Pl. 25, fig. 21.

Shell oblong, raised but contracted near the beak so as to make the latter more prominent, rather thin, opaque and lustreless: sculpture, several fine striæ which radiate towards the margin; most of them are alternately larger and smaller; they do not extend to the upper part of the shell; color whitish; beak placed in front, about one-third of the whole length; it is strongly incurved or hooked, and has a subspiral and deciduous apex; mouth oblong; margin thin, entire; inside smooth and glossy; head scar semicircular.

Length 0·2, breadth 0·125 inch.

A single and imperfect specimen but characteristic. Mr. Dall has seen it, and says it is probably his Cocculina beanii. I will, however, retain provisionally the specific name which I have given. (*Jeffreys.*)

Northeast Atlantic.

Tectura aduncа JEFFREYS, Proc. Zool. Soc. Lond. 1882, p. 672, t. 50, f. 4.

C. LEPTALEA Verrill. Pl. 25, figs. 7, 8.

Shell small, oblong ovate, rather high, with a prominent, small compressed, strongly recurved apex, with the tip small, strongly incurved; in eroded specimens becoming free and overarching, situated at about the posterior third of this shell.

The anterior slope of the shell is decidedly convex and considerably longer than the posterior slope, which is nearly straight, but a little concave beneath the apex; the side slopes are moderately convex. The sculpture consists of strongly marked, raised, very thin, and pretty regular concentric cinguli, which usually become finer and much closer towards the apex, but continue nearly to the extreme tip in perfect specimens; the intervals on the lower part of the shell are four times as wide as the cinguli, and are crossed by numerous, fine, wavy, radiating lines, much finer and closer than the cinguli, but easily visible with a lens; in crossing the cinguli they become a little thickened and give the margin of the latter a slightly crenulated appearance when viewed from above. In some cases these slight thickenings have the appearance of minute beads strung along the upper margin of the cinguli. The aperture is oblong-ovate, a little narrower anteriorly, with the sides a little compressed, but still somewhat convex, and with the anterior and posterior mar-

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gins bluntly rounded. The margin is thin, sharp, and plain. Color pale yellowish white. Epidermis indistinct. (*Verrill.*)

Length 4, breadth 2·8, height 2·5 mill.

Off S.-E., New England, in 1395 to 2033 fms.

Cocculina leptalea VERRILL, Trans. Conn. Acad. vi, p. 202, t. 32, f. 20, 20a, 20b.

C. DALLI Verrill.

Shell moderately elevated, with the front slope long and convex; the apex is small, acute, situated far back, nearly over the posterior margin, and not turned to either side; the posterior slope is abrupt and concave. Aperture broad oblong-elliptical, with the margin sharp and plain, muscular scars distinct. The sculpture consists, on the anterior half, of numerous well marked but small, raised, radiating ribs, which are crossed by thin, raised, concentric lines of growth, so as to form a row of small granules or vaulted scales along each rib. Along the sides the ribs are fainter, and posteriorly they are nearly obsolete, while the concentric lines remain distinct. Color grayish-white. (*Verrill.*)

Length of aperture 6, breadth 4·3, height 3, length of anterior slope 6 mill.

Off S.-E., New England

Cocculina dalli VERRILL, Trans. Conn. Acad. vi, p. 203.

C. CONICA Verrill.

Shell very small, thin, translucent, white, rather high, conical, with a very broad-ovate or nearly round base and a prominent, subspirally twisted apex, which is turned strongly backward, and obliquely to the left. The subspiral apex is relatively rather large, and the extreme tip seems to have been deciduous. The anterior slope of the shell rises at first rather abruptly, and then becomes very convex, forming the central and highest part of the shell, from which it descends a little to the apex; the posterior slope is concave under the overhanging apex, and then descends with a short, abrupt slope to the margin, which extends back but little beyond the apex. The sculpture consists only of rather irregular, concentric raised lines of growth, which run subspirally on the upper portion of the shell. The animal in alcohol has a nearly round foot and two small,

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slender, cylindrical tentacles, and is apparently without eyes. (*Verrill.*) Length 1, breadth 1, height 1 mill.

Off S.-E., New England, 499 fms.

Cocculina conica VERRILL, Trans. Conn. Acad. vi, p. 204.

C. SPINIGERA Jeffreys. Pl. 25, figs. 9, 10.

Shell oval, convex, rather thin, semi-transparent, somewhat glossy, especially on the upper part, where the spines have disappeared; sculpture: extremely numerous and delicate striæ which radiate towards the margin; these striæ are crested by rows of minute tubercles, each of which supports a fine short hair-like spine or prickle; the spines are easily removed, and disappear when the shell is subjected to the action of potash-water, showing that they are of a chitinous nature; the apex is quite smooth; colour white; beak very small, incurved and twisted downwards, forming a single whorl; it is persistent, but sometimes broken or injured by attrition; its propinquity to the hinder margin is in the proportion of 2¼ to 6 as representing the total length of the shell; mouth oval; inside polished; there is no septum. (*Jeffreys.*)

Length 0·175, breadth ·125 in.

Northeast Atlantic and off New England, 335–843 fms.

This species, obtained by Dr. Jeffreys in the Porcupine and Triton dredgings in the north Atlantic, is much smaller than either of the two preceding, or the specimens I have seen may not be fully grown, averaging only 1·5 to 2·0 mill. in length. It has the form of C. beanii, so far as the shell is concerned, with the sculpture of the most strongly sculptured specimens of that species, which, as above mentioned, sometimes have minute spinose projections at the intersections of the radiating and the concentric ridges. The nucleus, however, in the specimens of *C. spinigera* examined was constantly present, symmetrical and subspiral.

One feature which is often noticeable on the sedentary deep-sea shells, and especially on the limpets, is perhaps worth mentioning. A sort of spongy organism, apparently a sponge or a hydractinian, often covers the upper surface with a coating of fine straight spinules, which appear to be attached to the shell but are easily removed by wetting and rubbing. They are very abundant on Terebratulina Cailleti and other sculptured brachiopods, and I have observed them on all the species of *Cocculina* and on *Lepetella*. Dr. Jeffreys states that the spinules are not soluble in potash. There has been no dis-

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tinct outer crust nor any particular shape, to the aggregations of this sort which have come under my notice, but they seem to be preferably attached to prominences of the sculpture, and might easily be mistaken, in some cases, for part of the shell itself.

This *Cocculina* has fine sharp spines, properly belonging to the shell; but among those in the Jeffreys's collection I have seen none quite as sharp and long as those in the magnified figure (1a) of the plate to Dr. Jeffreys paper on the Triton mollusks.

The section *Coccopygia*, to which I have referred this species, probably includes *C. angulata* Watson, and other species which have not yet been critically examined with regard to the epipodial filaments. (*Dall.*)

Cocculina spinigera JEFFREYS, P. Z. S. 1883, p. 393, t. 44, f. 1, 1a, 1b, 1c.—DALL, Blake Gastrop., p. 348–350, t. 31, f. 7, 8, 9.

C. CORRUGATA Jeffreys. Pl. 25, figs. 11, 12.

Shell oval, convex, but somewhat depressed, thin, opaque and lustreless; sculpture: regular, fine and close-set concentric striæ or wrinkles, which are chiefly observable and stronger round the margin, especially in front or at the broader end; color chalky-white, except at the margin, which is yellowish-brown; beak small, incurved and slightly twisted to one side; the spire has a single whorl; the beak is placed close to the hinder margin, and nearly overlaps it; mouth oval; inside smooth; no septum. (*Jeffreys.*)

Length ·075, breadth ·05 in.

Northeast Atlantic.

A few specimens, with the last, and occurring under the same circumstances. This species differs from *C. spinigera* in size, sculpture and the position of the beak. It is also eyeless. (*Jeffreys.*)

Cocculina corrugata JEFFREYS, P. Z. S. 1883, p. 394, t. 44, f. 2, 2a.

C. PUSILLA Jeffreys. Pl. 25, fig. 22.

Shell roundish-oval, somewhat depressed, rather thin, opaque and lustreless; sculpture: extremely numerous, crowded and irregular, delicate, minute striæ, which radiate toward the margin as in other species, and cover the whole surface; color whitish; beak placed at less than one-third from the front margin; it is slightly incurved and pinched-up; apex apparently deciduous; mouth roundish-oval; margin thin; inside smooth and glossy; scars indistinct. (*Jeffreys.*)

Length 0·125, breadth 0·1 in.

North Atlantic.

Tectura pusilla, JEFFR. P. Z. S. 1882, p. 672, t. 50, f. 3.—*Cocculina pusilla* DALL, Blake Rep. p. 345.

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C. GALEOLA Jeffreys. Pl. 46, fig. 7.

Shell resembling an ancient helmet or casque, strong and thick for its size, opaque and lustreless; sculpture: numerous and close-set fine and minute radiating striæ, which covers the whole of the exterior; there are also occasional and well marked lines of growth, which are somewhat crowded towards the margin; color whitish beak small, incurved and pointed, placed very near the front margin and almost overhanging it; margin entire, compressed and forming a rim on the front half; inside smooth; scars as in Lepeta cæca. (*Jeffreys.*) Length ·225, breadth ·175 inch.

A single specimen.

If the peculiar shape of this shell may be regarded as a generic character, I would suggest for it the name DALLIA, as a mark of respect for the great malacologist, Mr. Dall, who has examined my specimen. He says it is "not an Acmeid," and would place it near *Capulus*; but he qualifies his remark by saying that "it is barely possible it may be a *Cocculina*." He is an unquestionably good authority on this as well as other departments of the mollusca and I venture with hesitation to differ from him. (*Jeffreys.*)

Northeast Atlantic.

Tectura galeola, JEFFR. P. Z. S. 1882, p. 672, t. 50, f. 5.

A species of very doubtful generic position.

C. ANGULATA Watson. Pl. 25, figs. 13, 14, 15.

Shell small, thinnish, with a strongish membranaceous epidermis, compressedly patelliform, oval, with a long convex anterior slope, a short slightly concave posterior slope, while the compressed side slopes are very steep and very slightly convex; there is a blunt reverted tip, but no embryonic shell; the surface is rayed by fine smooth, rounded, unequal riblets. Sculpture: longitudinals—from the top proceed radiating riblets, which are regular, delicate, well rounded, raised and unequal, a few being a little stronger than the rest, which, to the number of two to four, closely occupy the intervals. Spirals—these are microscopic, rounded, close-set, and very faint. Colour: under the strongish, hard, membranaceous, pale brownish epidermis the shell is porcellanous white. Apex: the embryonic apex has been removed, and a scarred plug at the very top of the back slope fills the hole it left. Margin thin and broken, and overlapped by the epidermis. Inside porcellanous, delicately fluted, open to the apex, with a strongish horse-shoe scar, with two

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oval muscular impressions, and the prominent head-scar shaped like that in Patella, only somewhat larger in proportion. (*Watson.*)

Length 0·13, breadth 0·07, height 0·07 in.

Philippines, 20 fms.

Cocculina angulata WATS. Challenger Rep. Gastrop., p. 30, t. 4, f. 2.

This species belongs to Dr. Dall's section *Coccopygia.*

Family ADDISONIIDÆ Dall, 1882.

Shell asymmetrical, porcellanous, something like *Caplulacmæa*, Sars.

Soft parts much as in the last family, but strongly asymmetrical, with an enormously developed lateral series of separately inserted gill-laminæ, like those of *Patellidæ* and without filamentary appendages of any kind. Radula with a large simple rhachidian tooth with, on each side, two large, simple transverse laterals, followed by two minute ones, and a large outer lateral with a strong tridentate cusp, outside of which is a single scale-like flat uncinus, bearing an elongated thickened ridge, but no cusp.

This family might be incorporated with the last were it not for the differences in the branchiæ and in its dentition. These latter are of great weight. The dentition of Addisonia is like nothing known in the whole group of Rhiphidoglossa, but, while it recalls the dentition of the Chitonidæ in some features, has a decidedly docoglossate aspect. Perhaps the most rational hypothesis is that this group bears to the preceding family much such a relation as in Pulmonata is borne by Cyclotacea of Troschel toward the Cyclostomacea, indeed, the resemblance of the radula of *Cocculina rathbuni* to that of the species of *Helicina* figured by Troschel is quite remarkable. This family contains, so far as known, but one genus. (*Dall.*)

Genus ADDISONIA Dall, 1882.

Addisonia DALL, Proc. U. S. Nat. Mus. 1881, p. 405, April 1882; Rep. on Blake Gastrop., p. 344.—JEFFREYS, P. Z. S. 1882, p. 673; 1884, p. 148.—FISCHER, Manuel, p. 757.—WATSON, Challenger Rep. p. 32.

Shell ovate, subconical, strongly symmetrical, porcellanous, thin; with a blunt apex curved backward, downward, and to the left, without an epidermis; with an unthickened, simple, entire margin; pedal muscular impression horseshoe-shaped, interrupted in front.

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Soft parts: head provided with two tentacles without eyes or eye tubercles; muzzle plain, simple; foot thin, orbicular, without lateral or posterior tubercles, processes or fringes; mantle edge simple, thickened; gill composed leaflets as in *Patella*, the series starting on the right behind the head and continued within the mantle edge backward, the body of the animal being asymmetrically placed with regard to the aperture of the shell to afford room for the enormous series of branchial leaflets; anus opening behind and above the head slightly to the right of the median line, and indicated by a small papilla. (*Dall.*)

A. LATERALIS, Requien. Pl. 25, figs. 26, 27.

Shell oval, obliquely conoidal, very smooth, shining, decussated by extremely fine radiating and concentric striæ. Nucleus excentric, posterior, obliquely recurved, situated below the lateral apex. Aperture oval, margin simple, acute. (*Tiberi.*)

Length of largest specimen 17, width 14, alt. 11 mill.; but usually smaller.

Mediterranean; North Atlantic, both European and American shores, living in 50–640 fms.; found dead in a wider range of depth.

Gadinia lateralis REQ. Coq. de Corse, p. 39, 1848.—PETIT, Cat. Moll. pp. 92, 264, 1869.—*Gadinia excentrica* TIBERI Journ. de Conchyl. 1857, p. 37, t. 2, f. 6.—WEINKAUFF Conchyl. des Mittelm. ii, p. 177.—DALL, Amer. Naturalist, p. 737, 1882.—*Tylodina excentrica* MONTS. Not. intorn. Conch. Medit. p. 57, 1872.—LOCARD, Cat. Moll. Mar. Fr. p. 67, 1886.—*Addisonia excentros* JEFFR. P. Z. S. 1882, p. 673; 1884, p. 148.—*Addisonia lateralis* DAUTZENBERG, J. de Conchyl. 1886, p. 205.—DALL, Bull. M. C. Z. xviii p. 344.—*A. paradoxa* DALL, Proc. U. S. Nat. Mus. 1881, p. 405, Apr. 1882.—*A. lateralis var. paradoxa* DALL, Bull. M. C. Z. xviii, p. 344, t. 25, f. 1 a–e.

Var. PARADOXA Dall. Pl. 25, figs. 1, 2, 3.

Shell ovate, thin, whitish; apex presenting an appearance as if an embryonic tip (perhaps spiral) had fallen and been replaced by a peculiarly blunt ovate apex, which in the young shell is nearly marginal, posterior and to the left of the middle line, but in the adult is considerably within the margin, curved downward and backward and much more asymmetrical; sculpture of faint grooves radiating from the (smooth) apex and reticulated by the stronger concentric lines of growth, beside which the extremely inflated arch

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of the back is somewhat obscurely concentrically waved; over the sculpture the shell has a polished appearance; margins thin, sharp; interior smooth, somewhat polished; the scar of the pedal muscle narrow, a considerable distance within the margin, the anterior ends of the scar enlarged, hooked backward on their inner edges; these ends connected by a line broadly arched forward and marking the attachments of the mantle to the shell over the head. (*Dall.*)

Family FISSURELLIDÆ.

Shell conical, limpet-shaped, non-spiral, (but with a spiral nucleus), having a perforation, anterior slit, notch or emargination for the passage of the anus; not nacreous; having a horseshoe-shaped impression of the adductor muscle; bilaterally symmetrical. Animal bilaterally symmetrical externally, the anal orifice on the median line either anterior, central or posterior. Gills paired, one on each side of the back, their free ends extending to the neck; muzzle stout; eyes on peduncles of variable length at the outer bases of the tentacles; mantle continuous or slit anteriorly; foot fleshy, bearing generally a row of epipodial papillæ. Adductor muscle horseshoe-shaped, open anteriorly. Radula with central, lateral and uncinal teeth, the laterals usually 5 in number, narrow except the outer one which is very large with a strongly recurved and denticulated cusp. Uncini numerous as usual in the Rhipidoglossa.

The classification of this very natural and well-defined family is still in an unsatisfactory condition, owing to the lack of knowledge regarding the animal. I have examined all of the alcoholic material accessible to me, and have freely used the results of my work, in combination with the observations of others authors, in the formation of generic groups. The dentition does not exhibit great diversity, and will need still more study before the value of certain characters can be regarded as settled. For this reason, and because the limits of my work forbid full illustration of the radulæ I have studied, I have deferred any detailed discussion of the dentition. I may, however, call attention here to the reliance I have placed on the form of the rhachidian tooth as a diagnostic character of my subfamily *Fissurellinæ*. It may also be noted that in most *Emarginulinæ* the odontophore is bilaterally asymmetrical, a unique and anomalous arrangement.

I believe that the genus *Fissurella* (as restricted herein) represents the latest modification of this family. I have seen no fossil species belonging to it. The *Emarginulinæ* include the more primitive

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types. Nearly all of the tertiary species, both of Europe and America, described as "*Fissurella*" belong to the genus *Glyphis*: a genus which is shown herein to have no especial relationship to *Fissurella* proper, beyond the bond of belonging to the same family.

Synopsis of Subfamilies of Fissurellidæ.

Subfamily I. FISSURELLINÆ Pilsbry.

Apex of shell wholly removed by the anal perforation, which is bounded inside by a callus with entire margins, not truncated or excavated posteriorly. Central tooth of the radula narrow. Shell wholly external, capable of containing the entire animal.

Subfamily II. FISSURELLIDINÆ Pilsbry.

Apex of shell wholly removed by the large anal perforation which is bounded inside by a callus with entire margin not truncated posteriorly. Central tooth of radula much broader than the adjacent laterals. Mantle generally enveloping shell and foot, wholly or in part; the animal much too bulky to be contained in the shell.

Subfamily III. EMARGINULINÆ Pilsbry.

Apex of shell generally not removed, the anal tube occupying an anterior slit, notch or sinuation; or if apex be removed by a perforation, the hole is provided internally with a shelf or septum projecting forward and downward from behind it, or if bounded by a callus, the latter is truncated or excavated posteriorly. Central tooth of radula broad.

Synopses of and keys to the genera are given under each of the subfamily heads, where also the characters of each subfamily are discussed in detail.

Subfamily I. FISSURELLINÆ Pilsbry.

Animal not too large to be contained in the shell when in a state of rest. *Rhachidian tooth of the bilaterally symmetrical radula narrow, like the lateral teeth on each side of it,* and having a well-developed cusp at its apex. Shell with the apex wholly removed by the subcentral or anterior perforation, which is bounded inside

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by a callus rim the outlines of which are entire, not truncated posteriorly.

The summit of the shell is always a little in front of the middle, even in those forms having it subcentral, and the border of the shell is in a plane, not elevated at the ends, except in the subgenus *Clypidella*.

The anatomical characters as far as known do not indicate more than one genus in this subfamily.

Genus FISSURELLA Bruguière, 1791.

Fissurella Brug., Encycl. Méth., Lamarck, An. s. Vert., and of authors.

Fissurella of early authors comprised all of the perforated limpets. It is, of course, as now understood, much more restricted by the elimination of the large-fissured forms (*Fissurellidea* etc.), and the genus *Glyphis*, which belongs to the subfamily *Emarginulinæ*.

Details of the anatomy are given under the several subgeneric heads.

Synopsis of Subgenera and Sections.

I. Summit of shell near the middle; basal margins level, not elevated at the ends. *Subgenus* Fissurella Brug.
   a. Margin of shell not crenulated, dark-bordered inside. *Section* Fissurella *s. s.*
   b. Margin of shell crenulated, without a dark border. *Section* Cremides Ads.

II. Summit leaning forward over the front end of shell; basal margins level. *Subgenus* Fissuridea Sw.

III. Shell flattened, shield-shaped, the two ends elevated, gaping; perforation narrow, situated in front of the middle. *Subgenus* Clypidella Sw.

Subgenus Fissurella.

The anatomy of the typical species (*F. picta* and its allies) is not thoroughly known. It appears that the mantle-edge is thick, crenulated above and below, granulate or papillose on its rather broad surface, the anal pore is surrounded by slender processes or papillæ, and the row of epipodial papillæ is continuous. In all of the species of the genus, the mantle and animal are contained completely within the cavity of the shell, in alcoholic specimens.

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The animal of *F. virescens* Sowb. (belonging to the section *Cremides*) is figured on pl. 61, figs. 13–15. The mantle-edge is fleshy and papillose, broad. The upper surface of the foot is longitudinally wrinkled and sparcely granose; epipodial row of papillæ extending all around the foot, and out upon the rostrum as far as the insertion of the tentacles. Gills equal, symmetrical, their anterior third free, and extending from a little behind the anal pore to the back of the neck. Border of anal pore minutely serrate.

In *F.* (*Cremides*) *barbadensis* the edge of the mantle is not at all fleshy, but is very narrow. It is not a simple edge, however, having short papillose scallops on the upper and lower edges, as if "pinked."

Section FISSURELLA, s. str.

These typical Fissurella are confined in distribution to that portion of the Western coast of South America washed by the cold Peruvian Current, which is derived from the eastward moving stream encircling the globe between 40 and 50 degrees S. lat. Upon striking the southern extension of S. America a portion of the current is deflected downward around the Horn, the rest following the coast up along Chili, leaving it in the neighborhood of Payta, Peru, whence it turns toward the Galapagos Islands and becomes lost in the Southern Equatorial current. The mollusks under consideration therefore, probably do not find waters which become warmer than about 70° Fahrenheit favorable to their existence; in these warmer regions they are replaced by other groups of Fissurella.

The typical *Fissurella*, those having a distinct dark marginal border inside, and with the edge of the shell not crenulated, fall into four groups of species, thus:

A. Hole long, its edges broadly eroded; interior wrinkled.
Group of F. crassa.

B. Edges of hole not much eroded; interior not deeply wrinkled.

a. Shell with radiating riblets. Group of F. picta.

b. Shell ovate or elliptical, with radiating striæ or smooth.
Group of F. limbata.

c. Shell oval or subcircular, striate. Group of F. peruviana.

The last division (c, group of F. peruviana), contains species ranging from Peru northward to California; thus falling outside the limits imposed by physical conditions upon species of the other divisions.

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Group of F. picta Gmel.

F. PICTA Gmelin. Pl. 45, figs. 9, 10, 11.

Shell conical, elevated, basal outline elliptical, the summit about central; having radiating riblets and strong concentric undulations; perforation oblong, twice as long as wide, about one-ninth the length of shell. Length of shell a trifle less than 1½ times the width.

The outline is elliptical, a trifle narrower in front. The slope of the sides is nearly straight, somewhat shorter and steeper in front. Color whitish with broad radiating stripes of purplish-red, about a dozen in number. The radiating riblets are numerous and somewhat unequal, not granose; they pass over from four to seven strong concentric folds, which give the slope a terraced appearance, when strongly developed. Inside white, smooth, with a narrow, grayish or purple-black edge. Muscle impression not rough, the area between its terminations and the perforation scarcely wrinkled. Margin entire. Sides of hole vertical. Length 82, width 56, alt. 28 mill.

Valparaiso, Chili.

Patella picta GMEL. in Syst. Nat. xiii, p. 3729.—*Fissurella picta* GOULD, U. S. Expl. Exped., atlas, t. 31. fig. 469, animal.—*Un Lépas rare de Magellan*, etc., DAVILA, Cat. Syst. et Raisonné des Cur. etc., i, p. 88, t. iii, f. C. 1767.—*Lepas ovata ampla*, etc., MARTINI Syst. Conchyl. Cab. vol. i, p. 131, t. xi, f. 90.

I have omitted all references except those of Gmelin, whose knowledge of the species was derived from Davila and Martini. Martini, too, seems to have known the shell from Davila's work only, and copied his figure. The illustration and especially the description given by Davila are excellent and unmistakable. I suppose that this is the *F. picta* of Reeve and other authors, but none of them give any differential characters from *F. maxima* either in figures or descriptions. The great altitude and strong concentric ridges are diagnostic. The dark rays are split into groups of lines by the white inter-liral interstices more than in *F. maxima*. The riblets are more equal than in *F. lata*, and the form is longer.

F. DARWINII Reeve. Pl. 30, fig. 7; pl. 46, figs. 15, 16, 17.

Shell oblong, conical, the summit a little in front of the middle; sculptured with numerous low rather obscure radiating riblets which are a little uneven but scarcely to be called granose. Per-

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foration oblong, nearly twice as long as wide, about one-ninth the length of the shell.

It is a little narrower in front, more conical than *F. maxima* but less elevated than *F. picta*. Whitish, becoming dark ashen or bluish at the edges, painted with numerous (about 13) reddish rays. Inside white, with a bluish-black border. Muscle-impression wide, smooth, not defined. Length 56, breadth 37, alt. 15 mill.

Straits of Magellan.

F. Darwinii REEVE Conch. Icon. f. 7, 1849.

This form is closely allied to *F. maxima*, but is higher, the muscle-scar broader and nearer to the margins, and the border is deep blackish-blue in color. Figs. 15–17 of plate 46 are drawn from the only specimen I have seen. It differs from *F. picta* in being less elevated and lacking strong concentric wrinkles, but may nevertheless prove to be an immature or arrested stage of that species.

F. MAXIMA Sowerby. Pl. 30, figs. 8, 9; pl. 33, figs. 46, 47.

Shell elliptical, a little narrower anteriorly, rather depressed, the apex subcentral; sculptured with rather weak radiating riblets, which are somewhat uneven or tuberculate. Perforation oval, about one-tenth the length of shell; interior dark-edged. Length 1½ times the breadth, more or less.

The outline is egg-shaped, more broadly rounded posteriorly. The cone is low, slopes feebly convex, often subconcave in places. It is solid and strong, of a whitish fawn-color, with broad rays of purplish-red, about 13 in number. The surface has rather weak, unequal radiating riblets, somewhat granose or roughened by rude growth-lines. The perforation is subcentral, about 1½ times as long as broad, elliptical in form. Inside white; central callus elliptical, not thickened; margin not crenulated, pallidly edged with the colors of the outside.

Length 82, width 56, alt. 13 mill.

Length 100, width 68, alt. 21 mill.

Valparaiso, Chili, to Peru.

F. maxima SOWB. P. Z. S. 1834, p. 123; Conchol. Illust., f. 18.—SOWB. Thes. Conch. iii, p. 187, t. 236, f. 8, 9.—D'ORBIGNY, Voy. Amér. Mérid. v, p. 475, t. 64, f. 4–7.—REEVE, Conch. Icon., f. 22.—WATSON, Challenger Gastrop., p. 33.—PHILIPPI, Abbild. ii, t. 1, f. 1.

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More depressed than *F. picta*, with wider perforation. It is an abundant species, and is well represented in figs. 46, 47 of plate 33. The radiating riblets are usually somewhat granose.

As varietal manifestations of *F. maxima* I am inclined to rank the following described forms:

Var. CONCINNA Philippi. Pl. 32, fig. 33; pl. 45, figs. 7, 8.

Shell oblong, narrower in front, thick, whitish rayed with purple; perforation large, oblong, bidentate on either side; margin rounded, pale, crenated outside.

Length 43, width 25, alt. 10 mill.; length of foramen 6 mill.

The form is narrower than *F. oriens*, and proportionally broader behind. I count about 28 rounded large ribs alternating with the same number of smaller ones, of about a third the size of the first, with very narrow interstices between them. The growth-lines form wavy wrinkles (the ribbing is unfortunately poorly rendered by the artist). On a whitish ground there are about fourteen purple rays. The edge is thick, rounded, not at all level and horizontal as in *F. latemarginata*, and bordered by a narrow yellowish or brownish crenated border. The interior is as usual, white. (*Phil.*)

Chili.

F. concinna PHIL. Abbild. iii, p. 66, t. 2, f. 5.

Reeve's figure of this form is copied on pl. 32, fig. 32; I do not know whether it really represents the species. The other figures are Philippi's. I have specimens of *maxima* which answer to the description and figures very well.

Var. HONDURASENSIS Reeve. Pl. 35, fig. 6.

"Distinguished by the superficial wrinkled character of the spreading ribs and the dark olive and black dotted marking around the orifice."

Hondurus?

F. hondurasensis REEVE Conch. Icon. t. 7, f. 48.

This seems to me to be merely a young *maxima*. The locality may be regarded as doubtful.

F. PHILIPPIANA Reeve. Pl. 33, fig. 40; pl. 58, figs. 24, 25, 26.

Shell ovate-oblong, rather depressed, black, sculptured with very numerous radiating unequal riblets and elevated incremental striæ; foramen oblong, horizontal, submedian; margin black, *crenulated*.

In its coloration and the narrow crenate border this species is

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very easy to tell from the similar Chilian forms. The riblets as well as the lines of growth are sometimes stronger, sometimes weaker, so that the shell is sometimes very rough, sometimes smooth; but never is it so smooth as *F. grandis* [*F. nigra* Less.] or *F. violacea*, and young individuals are remarkably latticed. These have also, frequently, light rays, which vanish further on. Size, contour and altitude are similar to *F. oriens* Sow., the hole smaller, placed more posteriorly, and surrounded by a narrow horizontal white margin. (*Phil.*) Length 20, breadth 12, alt. 5 lines.

Chili.

F. nigra PHIL. Arch. f. Naturgesch. 1845, i, p. 60; Abbild. ii, t. 2, f. 2 (not *F. nigra* Lesson).—*F. Philippiana* REEVE Conchol. Icon., errata to *Fissurella* and f. 37.—SOWB. Thes. Conch. iii, p. 186, f. 30.—*F. atrata* REEVE, Conch. Icon., t. 11, f. 73.

The *F. atrata* of Reeve (pl. 34, fig. 59) is evidently synonymous.

F. LATA Sowerby. Pl. 31, figs. 18, 19.

Shell rounded-oval, elevated, conical, the summit a little in front of the center, radiately sculptured with unequal, somewhat granose riblets. Perforation oblong, a little less than half as wide as long, and about one-ninth the length of shell.

The shell is quite conical, short-oval, the sloping sides a little convex or nearly straight. It is a trifle wider behind the middle; solid, grayish with numerous rays of purplish-red. The surface has numerous little-raised and rather ill-defined radiating riblets, of which one in the middle of each light ray is generally stronger; they are all roughened by low, irregular but rather acute granose swellings. Inside white, rather smooth; margin alternating gray and reddish, especially in immature examples. Sides of the perforation nearly perpendicular, and in some shells the surface just around it is rather speckled than rayed.

Length 83, breadth 66, alt. 28 mill.

Length 63, breadth 50, alt. 25 mill.

Chili.

F. lata SOWERBY P. Z. S. 1834, p. 124; Conch. Ill. f. 63.—REEVE, Conch. Icon. f. 5.

A shorter, more elevated species than *maxima;* more allied to the *F. costata* of Lesson, but that shell is flatter and the perforation is smaller.

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F. COSTATA Lesson. Pl. 30, fig. 10; pl. 35, fig. 11.

Shell depressed, rounded-oval, apex a trifle in front of the center; having radiating riblets; perforation small, oblong, twice as long as wide, one-thirteenth to one-fifteenth the length of the shell, and having a tendency to develop two little projections or teeth on each side.

The shell is very like *F. lata*, but is more depressed more nearly circular, and the hole is smaller. It is ashen grayish, rayed rather obscurely with olive-brown.

Length 74, width 63, alt. 27 mill.

Length 67, width 55, alt. 17 mill.

Valparaiso, Chili.

F. costata LESSON, Voy. de la Coquille p. 410, 1830; Illust. Zool., t. 12.—REEVE, Conch. Icon., f. 14.—SOWB. Thes. Conch. iii, p. 187, f. 15, 205.—*F. chilensis* SOWB. Conch. Illust., f. 36.— *F. rudis* DESH., teste Reeve & Sowerby.

More rounded than usual, *and with an exceptionally small foramen.* Specimens of very depressed form occur, the flattest I have seen measuring, length 49, breadth 39, alt. 10 mill.;—the altitude being a trifle over one-fifth of the length, while in the more typical examples the height is contained about three times in the length.

F. POLYGONA Sowerby. Pl. 60, fig. 84.

Oval, angulate, anteriorly narrowed, white, interruptedly rayed with purple; with numerous scabrous striæ and fewer cateniform radiating riblets; inside white, margin spotted. This beautiful shell is distinguished by scabrous striæ, with noduliferous or chain-like ribs at intervals. (*Sowb.*)

Falkland Is.

F. polygona SOWB. Thes. Conch. iii, p. 186, f. 177, 137.

F. EXQUISITA Reeve. Pl. 32, fig. 34.

Shell ovate, scarcely attenuated anteriorly, thin, rather depressed, raised in the middle, radiately closely ridged, ridges somewhat irregular, corrugated, obscurely nodulous, orifice very large, contracted at the sides; yellowish-white, conspicuously regularly rayed with purple-black; internal margin tessellated. (*Rve.*)

Straits of Magellan.

F. exquisita RVE. Conch. Icon. f. 74, 1850.

F. STELLATA Reeve. Pl. 32, fig. 32.

Shell ovate, depressed, rather elevated in the middle, obscurely rayed with ridges which are obsoletely nodulous; orifice oblong,

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rather narrow, its sides excavated in the middle; whitish rayed with light red, the rays being blotched with blackish-purple; internal margin broadly tessellated. (*Rve.*)

Valparaiso.

F. stellata RVE. Conch. Icon. f. 80, 1850.—SOWB. Thes. Conch. iii, p. 187, f. 82.

This is unquestionably a young shell of one of the larger species, but without series from young to adult, it is impossible to determine which.

Group of F. limbata Sowb.

F. NIGRA Lesson. Pl. 35, figs. 1, 2.

Shell large, oval, conical, the summit in front of the middle; color black or purplish black, not rayed; surface nearly smooth, but with fine, obsolescent radiating striæ. Perforation oblong, about one-tenth the length of the shell, its sides in young specimens bidentate.

The form is oval, conical; surface nearly smooth, of an inky purplish-black hue. Inside white with a black border.

Length 100, breadth 70, alt. 32 mill.

Valparaiso and Isl. of Chiloe, Chili; Peru.

F. nigra LESSON Voy. de la Coquille, Zool., vol. ii, p. 412, 1830. —REEVE, Conch. Icon., f. 11.—SOWERBY, Thes. Conch. iii, p. 184, f. 14.—*F. grandis* SOWERBY P. Z. S. 1834, p. 123; Conchol. Illust., f. 48.—PHILIPPI, Abbild. ii, t. 2, f. 2.—*F. violacea Escholz*, PHILIPPI, Abbild. ii, t. 2, f. 3.

Readily recognized by its large size, purplish-black inky color, and the nearly smooth surface.

F. LIMBATA Sowerby. Pl. 32, figs. 26, 39.

Shell oval, conical, the summit a little in front of the middle; surface nearly smooth, not striate; perforation long and rather narrow, more than twice as long as broad, the sides nearly straight, usually more or less bidentate; length of hole contained 7 to 8 times in total length of shell.

The form is ovate, slightly narrower in front, conical, the height of the cone being between one-fourth and one-fifth the length of the shell. It is solid, of a light grayish color conspicuously rayed with reddish-purple, the rays having a tendency to split into two; and usually a tract around the hole is stained deep blackish-purple. Old specimens, however, are almost always eroded or dull and cor-

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roded in appearance, scarcely showing rays. There are no striæ, even in young shells. The inside is white, with a rather narrow purplish-black border (2 to 3 mill. wide); muscle-impression conspicuous, roughened.

Length 77, breadth 51, alt. 20 mill.

Length 52, breadth 39, alt. 14 mill.

Chili.

F. limbata Sowb. P. Z. S. 1834, p. 123; Conchol. Illust. f. 74.—Reeve, Conch. Icon. f. 10, 12.—Sowb. Thes. Conch. iii, p. 184, f. 23, 24.

Allied to *F. nigra*, but having color rays and entirely lacking radiating striæ.

F. punctatissima Pilsbry. Pl. 58, figs. 21, 22, 23.

Shell ovate, conical, the summit about central; sculptured with close fine radiating striæ, which become coarser toward the margins. Perforation oblong, 2½ times as long as broad, parallel sided, its length contained 8 times in the length of the shell. Dark margin of the inside very narrow.

The outline of the base is about as in *F. latemarginata*, but it is a much more elevated cone. It is solid, thick, of a reddish fawn color, radiately closely striate. The inside is white, with a very narrow dark-grayish border. The area to the sides and in front of the hole, as far as the adductor muscle, is finely and closely punctate. The muscle scar is conspicuous, being moderately roughened.

Length 88, breadth 66, alt. 22 mill.

Length 93, breadth 66, alt. 23 mill.

Chili.

The diagnostic characters of this large species may be very briefly stated: *exterior finely radiately striated; inside white with a very narrow dark border, the area occupied by the gills densely punctate.* There is no eroded tract around the key-hole. One specimen was presented to the Academy by Mr. Frank C. Baker, and another is in the collection of John Ford Esq. of Philadelphia, with the locality Valparaiso, Chili.

F. bella Reeve. Pl. 33, fig. 48.

Shell deeply convex, rather elevated in the middle, acuminately attenuated anteriorly, radiately, obscurely grooved; basal margin narrow; orifice oblong; ash-brown, banded concentrically alternately lighter and darker, rayed with bright crimson lake. A com-

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paratively smooth species, conspicuously painted with thirteen purple lake rays. (*Rve.*)

Cape Horn.

F. bella RVE., Conch. Icon. f. 21, 1849.—SOWB. Thes. Conch. iii, p. 185, f. 25.

The elevated form, notably narrowed in front, is characteristic.

F. PULCHRA Sowerby. Pl. 33, fig. 50.

Shell ovate-oblong, depressed, smooth; perforation oblong, more than twice as long as wide, and a little less than one-seventh the length of the shell, the sides each with two little denticles.

The form is long-ovate, narrower in front, much depressed. Color light purplish-ashen, obscurely rayed with purplish-red, and profusely *speckled around the orifice with red dots.* Inside white with a border (2 to 3 mill wide) of dark purplish-brown. Muscle-scar distinct. Length 54, breadth 35, alt. 7 mill.

Valparaiso, Chili.

F. pulchra SOWB. P. Z. S. 1834, p. 124; Conchol. Illust. f. 24.—REEVE, Conch. Icon. f. 9.—SOWERBY, Thes. Conch. iii, p. 184, f. 31.

In general form and flatness this species is like *latemarginata*; but it is not radiately striated. The sprinkling of red dots around the middle part is also characteristic. This is a character usually shown by young specimens of many rayed species, but in this one it extends over a larger tract and is, therefore, retained in the adult.

F. BRIDGESII Reeve. Pl. 30, fig. 3.

Shell ovate, slightly attenuated anteriorly, rather thick, depressed, concentrically very finely striated; orifice oblong, rather wide, sides excavated in the middle; concentrically banded with brownish-purple and ashy-black, obscurely white rayed; basal margin very broad, purple. (*Rve.*)

This fine species approaches the *F. latemarginata* in general aspect but will be found to differ materially on comparison. It is of thicker growth, not radiately striated; the orifice differs in being larger and excavated at the sides, and the painting is of a lighter purple-ash. (*Rve.*)

Quintero, Chili.

F. Bridgesii RVE., Conch. Icon. f. 16, 1849.—SOWB. Thes., iii, p. 184, f. 21, 22, 34.

Compare also *F. limbata.*

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F. GRISEA Reeve. Pl. 39, fig. 9.

Shell ovate, rather depressed, smooth, concentric lines of growth somewhat irregular. Orifice rather small, oblong. Ash-gray, violet toward the base, obscurely rayed. This species has no sculpture to characterize it, but the coloring is peculiar. (*Rve.*)

Habitat unknown.

F. grisea RVE, Conch. Icon., f. 38, 1849.—SBY. Thes. Conch. iii, p. 184, f. 85.

Evidently closely allied to *F. bridgesii*, but more oval and elevated, the foramen more central.

F. FULVESCENS Sowerby. Pl. 33, fig. 49.

Shell oblong, depressed, fulvescent, narrower in front; milk-white inside, the margin subthickened, subreflexed; outside smooth, radiately substriate and painted with rufous; aperture oblong, its sides obsoletely bidentate. (*Sowb.*)

Length 1·6, breadth 0·9 inch.

Valparaiso, Chili.

F. fulvescens SOW. P. Z. S. 1834, p. 127; Conchol. Illust., f. 49.—REEVE Conch. Icon., f. 42.—SOWB. Thes. Conch., p. 184, f. 36.

Reeve says: From the bright yellow coloring of this shell, the rays have very much the appearance of sunbeams.

F. ORIENS Sowerby. Pl. 46, figs. 18, 19; pl. 34, fig. 58.

Shell oblong, conical, summit about central; sculptured with close fine distinct radiating striæ. Perforation about one-ninth the length of the shell.

The outline is elongated-elliptical,—more lengthened than a specimen of *F. maxima* or *F. darwinii* of equal size, and the radiating striation is much finer, more even, than in these two species and their allies. The color-pattern in typical examples, consists of concentric zones alternately light grayish and darker purplish; over the whole are reddish rays (to the number of 13–15), each one split more or less obviously into two. The tract immediately adjacent to the perforation is speckled. Inside white, the marginal border grayish, rather narrow. Length 46, breadth 27, alt. 11 mill.

Coast of Chili and Is. of Chiloe.

F. oriens SOWB. P. Z. S. 1834, p. 124; Conchol. Illust. f. 25.—REEVE, Conch. Icon. f. 13.—SOWB. Thes. Conch. iii, p. 186, f. 19, 20.

It is like *latemarginata* in the fine even striation, but is a narrower, higher shell, with pale narrow internal border.

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F. MEXICANA Sowerby. Pl. 34, fig. 60.

Shell oblong, reddish-brown with darker rays and numerous close-set radiating grooves, which are decussated by very fine concentric striæ; dorsal aperture oblong, rather contracted in the middle, and with two obsolete teeth on each side; inside white with a purple-brown crenulated margin. (*Sow.*)

Length 1·25, breadth 0·56 inches.

Real Llejos, Mexico.

F. Mexicana Sow. Conch. Ill. *Fissurella* p. 8, fig. 61.—REEVE, Conch. Icon. f. 40.—SOWERBY, Thes. Conch. iii, p. 186, f. 26, 27, 28, 78.

The orifice, says Reeve, has a very decided white border. I have not seen authentic examples. Compare *F. oriens* Sowb. The locality needs confirmation; for, as I have shown on page 143, the species of this group do not extend above Peru.

F. LATEMARGINATA Sowerby. Pl. 32, figs. 36, 37, 38.

Shell depressed, ovate, narrower anteriorly, summit a trifle in front of the middle; radiately finely striated all over. Perforation oblong, twice as long as wide, with straight, parallel sides, its length contained 8½ times in the total length of the shell.

The shell is depressed, egg-shaped in outline, the front part being narrower; it is solid, of a *uniform reddish purple* color outside, white with a *broad dark purple or chocolate border* inside. The interior has indistinct radiating fine striæ. The muscle-impression is quite broad, and is near to the wide dark margin. The sides are a little arched, so that when resting on a flat surface the ends alone support the shell.

Length 68, breadth 50, alt. 12 mill.

Length 69, breadth 49, alt. 11 mill.

Chili; Peru.

F. latemarginata Sow. P. Z. S. 1834, p. 126; Conchol. Illust., f. 69.—REEVE, Conchol. Icon., f. 19.—SOWERBY, Thes. Conch. iii, p. 185, f. 6, 7, 12.

The broad purple border of the interior, and fine striation and uniform color of the outside are characteristic.

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Var. BIRADIATA (Frembly) Sowb. Pl. 35, fig. 3; pl. 46, figs. 12, 13, 14.

Shell of the same general form as *latemarginata*, similarly striated, but marked outside with obscure milky-bluish rays, of which one on each side of the perforation is more prominent.

Valparaiso, Chili; Iquiqui, Peru.

F. biradiata (Frembly MSS., in) SOWERBY, P. Z. S. 1834, p. 124; Conchol. Illust., f. 23, 52.—REEVE Conch. Icon., f. 20.—SOWERBY Thes. Conch. iii, p. 185, f. 1–3.—*F. galericulum* REEVE Conch. Icon., f. 77.

F. galericulum Rve. (pl. 39, fig. 93) is the same. Fully adult examples scarcely show the two side rays, but the obscure rays over the whole disk usually persist. Other specimens lose all rays when old, the younger shells having only the two side streaks.

Var. CUMINGII Reeve. Pl. 30, fig. 1.

"Radiately ribbed, ribs obtuse, unequal, obscurely squamately nodose; purplish ash or rust color, rayed with deep purple, white around the orifice, sprinkled with a few obscure dots; basal margin very broad, fulvous ash, blotched with purple." (*Rve.*)

Quintero, Chili.

F. Cumingii RVE. Conch. Icon., f. 17, 1849.—SOWERBY, Thes. Conch. iii, p. 187, f. 5, 132.

The specimens before me differ from *latemarginata* in having coarser radiating striæ, in being rayed, and in the color of the broad basal margin inside, which is of a grayish tint tessellated with dull red, instead of being uniform deep brown as in the typical *latemarginata*.

Group of F. crassa Lam.

F. CRASSA Lamarck. Pl. 34, figs. 51, 52, 53.

Shell oblong, depressed, with subcentral summit. Surface smooth except for broad, low, scarcely perceptible radiating waves, more prominent at the front end. Perforation sole-shaped, narrowed a little in front of the middle, one-sixth to one-eighth the length of the shell, the margins eroded around each end of the hole.

The outline is oblong, a trifle narrower in front, the sides about parallel. It is solid and thick, lusterless, of a brownish fawn-color. The interior is pink within the muscle-impression, and in front of the hole and at its sides there are strong converging wrinkles or fur-

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rows. The muscle-impression itself is yellowish in color, and is roughened at its posterior curve. There is a narrow brown margin.

Length 85, breadth 52, alt. 16 mill.

Chili.

F. crassa LAM. Anim. s. Vert. vi, 2d pt., p. 11, 1822.—REEVE, Conch. Icon. f. 4.—SOWERBY Thes. Conch. iii, p. 184, f. 15, 16.—SOWERBY, Conchol. Illust., f. 11.

The measurements of an average specimen are given above. The pink interior, *wrinkled* as if guttered by running water (as indeed it probably is) is very characteristic.

Group of F. peruviana Lam.

Smaller shells than those of the preceding groups, of a conical shape, and having a narrow but well-defined dark border inside. The few species range from Peru and the Galapagos Islands to California.

F. PERUVIANA Lamarck. Pl. 33, figs. 41–45; pl. 42, fig. 57, 58, 59.

Shell rounded-oval, elevated, conical, the orifice a little in front of the middle; radiately finely striated; perforation small; oval, about one-tenth the length of the shell; inside white, margin alternately red and gray.

The form is conical, elevated, lateral slopes nearly straight. It is rather thin, finely radiately striated; inside smooth; margin smooth, narrowly bordered. Color blood-red toward the summit, becoming darker, more purplish below, and generally more or less rayed with deep purple. The radiating striæ are not equal in size, from 3 to 7 smaller ones intervening between slightly larger riblets. On some specimens this inequality is more marked.

Length 35, breadth 30, alt. 18 mill.

Length 26, breadth 21, alt. 10 mill.

San Antonio, mouth of the Rio Maipa; S. Lorenzo; and Callao, Peru.

F. peruviana LAM. An. s. V. No. 17.—REEVE, Conch. Icon. f. 26.—SOWB. Thes. Conch. iii, p. 185, (not *F. peruviana* Delessert, Recueil, t. 24, f. 7!) *F. subrotunda* DESH. in Encyc. Méth. and 2d. edit. of Lamk. vii, p. 602.—*F. affinis* GRAY, P. Z. S. 1834, p. 125.—SOWB., Thes. Conch. iii, p. 185, f. 42, 179.—Conch. Illust., f. 44.—*F. occidens* GOULD, Proc. Bost. Soc. N. H. ii, p. 156, 1846 Exploring Expedition Shells p. 364, figs. 473.

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May be known by the conical form and purple-red coloration. Carpenter's citation of this form from Mazatlan needs confirmation.

F. CLYPEUS Sowerby. Pl. 60, fig. 82; pl. 31, fig. 20.

Shell ovate, rather thick, depressed, obscurely radiately ridged, ridges distant, obsoletely prickly nodose; orifice oblong-ovate, rather small; whitish peculiarly rayed in a reticulated manner with burnt black; interior margin tessellated. (*Rve.*)

St. Elena, West Columbia.

F. clypeus SOW. P. Z. S. 1834, p. 128; Conch. Illust., f. 77.—REEVE, Conch. Icon. f. 76.—SOWERBY, Thes. Conch. iii, p. 185, f. 63.

F. MURICATA Reeve. Pl. 39, fig. 5.

Shell ovate, conical in the middle, rather depressed at the sides, radiately, somewhat obscurely ridged and striated, ridges prickly nodose; orifice oblong, sides excavated in the middle; blackish-purple, whitish around the orifice. (*Rve.*)

Habitat unknown.

F. muricata RVE. Conch. Icon. f. 103.—SOWB. Thes., p. 186, f. 68.

F. VOLCANO Reeve. Pl. 62, figs. 16, 17, 18.

Shell oval, usually a little narrower in front, the orifice a little in front of the middle, oblong, often obscurely tripartite, about one-eighth the length of the shell; surface with radiating unequal riblets, often subobsolete. Color pink-ashen with 13 to 16 purplish rays, often speckled near the summit. Inside white, smooth, frequently with a pink line bounding the callus around the perforation; border narrow, dark, alternately pink or purple and gray.

Length 24, breadth 18, alt. 11 mill.

Length 25, breadth 17, alt. 10 mill.

San Hippolite Point, L. Cal. to Sta. Cruz, Cal.

F. volcano RVE. Conch. Icon. f. 2, 1849.—SOWERBY, Thes. Conch. iii, p. 192, f. 87.—And of authors generally.—*F. ornata* Nuttall MS. in CARPENTER, P. Z. S. 1856, p. 222.

A pretty species, abundant on the coast of California. Beach-worn shells are pink with red rays, but fresh specimens have a duller ashen color. There is considerable variation in the prominence of the radiating riblets.

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F. SPONGIOSA Carpenter. Unfigured.

Shell elongated, compressed, conical, narrower in front, dilated behind; outer surface not lirate or striate, but having a sort of spongy texture; green, the young with lines, adult with radiating spot of chestnut. Aperture elongated, obscurely trilobed; inside shining, ashen-white, showing more or less the spots of the outside; marginal callus of the hole purple-red; muscle-cicatrix irregular, calloused inside and punctulate anteriorly; margin acute, hardly crenulated, in young shells spotted with chestnut. (*Cpr.*)

Length ·7, breadth in front ·3, behind ·43, alt. ·24; hole ·14 by ·04 inch.

Mazatlan; extremely rare.

F. spongiosa CPR. Mazat. Cat. p. 219, 1857.

Carpenter says: "Only two specimens were found of this singular little shell; the younger one of which, though most highly colored, is diseased within, and displays neither the livid color of the fæcal callus nor the punctures on the anterior part of the general callosity which fills up the space between the irregularly jagged muscular scar and the region of the hole. It most resembles *F. catillus* Reeve. The external surface is loose and rough."

Unfigured species.

F. RADIOSA Lesson.

The shell of this Fissurella is oval-oblong, lightly convex, the sides a little depressed. The fissure is elongated, contracted, provided with two teeth on each side, and a little in front of the middle of the shell; its circumference is smooth, white. The upper surface is covered with straight ribs radiating from center to circumference, enlarging toward the latter. These ribs are traversed by concentric fine, close striæ, which make the surface granular. The ribs are separated by profound narrow grooves, and they are arranged with three smaller ribs between each pair of larger ones, all over. The outside is golden yellow, with gradually widening violet-purple rays. The edge is regular, denticulated below, white and purplish-black alternately. Inside smooth, porcellaneous white. (*Less.*) Length 13, breadth 7, alt. 2½ lines.

Falkland Is.

F. radiosa LESS. Voy. de la Coquille, ii, pt. 1, p. 411.

Compare *F. darwinii*. This species has not been figured, or noticed in the monographs.

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F. OBOVALIS Lesson.

This Fissurella is elongated-oboval, rounded posteriorly, contracted in front, a little produced in front and behind so that when placed upon a horizontal plane the extremities alone support it. Fissure oblong. its sides straight, thick, 4–toothed; the fissure placed in front of the middle. Outer surface having close radiating ribs, decussated by concentric striæ. It is olive-brown, often encrusted. Inside porcelain-white. Edge entire, blackish, a little oblique. The horse-shoe-shaped muscle-impression is strongly marked. (*Less l. c.*) Length 21, breadth in front 8, behind 18, alt. 7 lines.

Province of Concepcion, Chili.

Section CREMIDES H. & A. Adams.

Cremides ADS. Genera Rec. Moll. i, p. 446, 1858.

Fissurella with the orifice near the middle, the outer surface radiately ribbed or striated, the inside without a dark marginal border, and more or less crenulated on the edge, group in this section. They inhabit tropical and subtropical coasts of America, with a few species from South Africa and the Mediterranean.

The species, in the following pages are grouped *geographically*—a grouping probably as natural as any other that could be devised for such variable shells.

Species from the West Coast of the Americas.

F. VIRESCENS Sowerby. Pl. 31, figs. 15, 16, 17.

Shell oval, elevated, conical; the orifice about in the middle, large, contracted in the middle, its sides more or less flaring outward.

The shell is very solid and strong, oval, or a little narrower anteriorly, elevated, sculptured with numerous fine unequal (alternately larger and smaller) radiating riblets. Color uniform greenish gray without rays. Inside green, smooth, the callus around the perforation flat; border finely crenulated.

Length 50; breadth 38, alt. 18 mill.

Panama to Mazatlan.

F. crassa SOWB. Genera of Shells, (Cephala), *Fissurella* f. 2.—*F. nigropunctata* SOWB. P. Z. S. 1834, p. 125; Conch. Illust., f. 51.—REEVE, Conch. Icon. f. 8.—Sowb. Thes. p. 188, f. 33.—*F. virescens* SOWB. P. Z. S. 1834, p. 125.—REEVE, Conch. Icon. f. 12.—SOWB.,

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Thes. p. 188, f. 37.—CARPENTER, Maz. Cat. p. 213.—C. B. AD. Panama Sh., p. 238.

A very solid, conical species, green inside and having a bipartite orifice. The callus around the hole inside is flat, like a little deck, and of a still darker shade of green. The synonomy given above, cannot, I believe, be seriously questioned. The name *virescens* has priority in Sowerby's original paper. It differs from the form called *nigropunctata* in being a little more expanded for its height, having the radiating riblets larger and less equal; uniform greenish-gray without rays.

Var. NIGROPUNCTATA Sowb. Pl. 31, figs. 11, 12, 13.

Differs in being a little more elevated, the radiating riblets smaller, more equal; greenish-gray, having about 9 rays, each composed of a group of black lines which are usually interrupted into dots.

Length 43, breadth 32, alt. 20 mill.

Length 58, breadth 43, alt. 24 mill.

Panama; Gallapagos Is.

F. MACROTREMA Sowerby. Pl. 31, fig. 14.

Shell ovate, sometimes rather elevated, radiately striately grooved; orifice elongately oblong, contracted in the middle; greenish, rayed with brown, red or purple-black; interior pale green. (*Rve.*)

Gallapagos Is.

F. macrotrema SOWB. P. Z. S. 1834, p. 125; Conchol. Illust., f. 41. —REEVE, Conch. Icon., f. 31.—SOWB., Thes., p. 191, f. 86, 90.

F. ALBA Carpenter. Pl. 45, figs. 1, 2, 3, 4.

Shell oval, a little narrower in front, conical, summit a little in front of the middle. Perforation oblong, contracted in the middle, about one-sixth the length of the shell, its sides produced upward in little points on either margin of the orifice.

The form is conical, elevated, with an orifice of the same shape as that of *F. virescens.* It is solid, white (rarely black-rayed), sculptured with radiating riblets, very variable in size, and usually a little uneven or nodulous. Inside white (or very pale flesh color), rarely with a slight greenish tinge toward the callus. Orifice surrounded by a thick callus, (not so flat as in *F. virescens*), *bounded by a black line;* outer margin crenulated.

Length 32, breadth 24, alt. 10 mill.

Length 31, breadth 22, alt. 12 mill.

Length 27, breadth 17, alt. 11 mill.

Mazatlan.

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F. alba Cpr. Mazat. Cat., p. 218.—*F. gemmata* Mke. Zeitschr. f. Mal. 1837, p. 186 (probably; see Maz. Cat., p. 218.)

Generally encrusted with coralline, as the specimens figured are. The white, ribbed shell, with a dark line around the internal callus, reminds one of the Cape Verde Island group of *F. alabastrites*, *F. humphreyi* and *F. glaucopsis*.

F. tenebrosa Sowerby, Jr. Pl. 60, fig. 69.

Shell similar to *F. nigrocincta* but more rounded, with cloudy black rays; riblets scarcely elevated, subnodose. Margin of the aperture scarcely crenulated. A more rounded shell, more loosely ribbed and cloudily black-rayed than the preceding [*F. nigrocincta*], only slightly crenulated at the margin of the aperture. (*Sowb.*)

"*California.*"

F. tenebrosa Sowb. Thes. Conch. iii, p. 192, f. 67.

Evidently very closely allied to *F. nigrocincta*, probably falling within the range of variation of that form.

F. ostrina Reeve. Pl. 34, fig. 54.

Shell ovate, slightly conical, rather compressed at the sides, radiately ridged, ridges subrugose, irregular, obscurely nodulous; orifice oblong, narrow, sides excavated in the middle; very dark purple, pinkish toward the orifice, greenish within. (*Reeve.*)

Panama.

F. ostrina Rve. Conch. Icon. f. 106, 1850.

F. nigrocincta Carpenter. Pl. 45, fig. 5, 6.

Shell oval, broad, conical, elegantly painted with radiating black lines; sculptured with delicate radiating striæ; orifice subcentral, obscurely trilobed; inside white, margin delicately crenulated, denticulations black; callus white, encircled by a black line.

Differs from the young of *F. alba* in its greater breadth, less compressed form, finer striæ and crenulations; from *F. nigropunctata* in the black line around the callosity; and from both in the form of the hole, which is trilobed, not contracted in the middle. (*Carp.*)

Length ·75, breadth ·52, alt. ·3 inch.

Mazatlan.

F. nigrocincta Carp. Mazat. Cat., p. 217.—Sowb. Thes., p. 191, f. 64, 65.

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F. RUGOSA Sowerby. Pl. 31, figs. 21, 22.

Shell oblong, the outline generally angular, narrower in front, depressed; summit in front of the middle. Hole variable in size and shape, oval or oblong, its sides vertical, not noticeably contracted in the middle.

The outline is very variable and irregular, usually angled; rather depressed; rather thin; varying from red to white in color of the outside; sculptured with numerous *unequal*, more or less nodulous radiating riblets. Inside pale green, the callus encircled by a slightly darker line or not. Border irregularly toothed and crenulated.

Length 30, breadth 20, alt. 6½ mill.
Length 27, breadth 17, alt. 7 mill.

Mazatlan to Gallapagos Is.

F. rugosa SOWB. Conch. Illust., f. 51.—REEVE, Conch. Icon., f. 56.—SOWB. Thes. Conch. iii, p. 189, f. 46, 47.—CARPENTER, Maz. Cat., p. 215.—*F. chlorotrema* and *F. humilis* MENKE, Zeitschr. f. Mal. 1847, p. 186.—? *F. viminea* MKE. Zeitsch. 1851, p. 131, (not of Rve.)

The ribbing of this species is extremely variable, but generally more irregular than in *F. virescens*. The orifice is more anterior than in that species.

F. RUBROPICTA Pilsbry. Pl. 36, figs. 34, 35, 36.

Shell varying from ovate to elliptical, conical, the summit a little in front of the middle, sculpture consisting of rather rude radiating riblets alternately larger and smaller. Dorsal orifice oblong, each of its sides a little contracted and bidentate, becoming smaller as it penetrates; its length measured inside, contained 8 to 10 times in the length of the shell. Inside greenish, stained with crimson inside of the muscle-scar, the perforation-callus green.

The form is rather straightly conical; surface dull, lusterless, corroded, the sculpture being entirely effaced on the earlier portion of adult shells; riblets uneven, unequal. Color on the corroded surface greenish, painted on the lower part with narrow black rays. These rays are far more prominent on young shells. The inside is of a delicate green shade, fading to white at the border, the distinctly impressed muscle-scar white, area inside the muscle-scar of a deep crimson, or crimson and white, the hole-callus green, oval and dis-

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tinct. Margin prettily crenulated, dotted at irregular intervals on the very edge with black.

Length 32, breadth 21½, alt. 11 mill.
Length 30, breadth 18, alt. 9 mill.
Length 28, breadth 19. alt. 11 mill.
Lagoon Head (Mainland of Lower California opposite Cedros Id.)

This species, collected by Henry Hemphill in 1889, seems quite distinct from other forms I have seen. The crimson interior is especially notable.

F. MICROTREMA Sowerby. Pl. 34, fig. 55.

Shell ovate, somewhat attenuated anteriorly, rather depressed, rough, radiately thinly ridged, some of the ridges rather prominent; orifice minute; brown, sprinkled with a very few whitish spots, ridges purple-red; dark green around the orifice; interior greenish. (*Rve.*)

Real Llejos, Central America.

F. microtrema SOWB. P. Z. S. 1834, p. 125; Conch. Illust., f. 50. —REEVE Conch. Icon. f. 44.—SOWB., Thes., p. 190, f. 54, 55.

Sowerby says: foramen small, black margined, situated above the middle, calloused inside, the callus white, black-margined. Like *asperella* but with the minute ribs imbricated.

Rochebrune has reported this species from the Cape Verde Is.; but his identification is probably incorrect. (See Nouv. Arch. du Mus. 1881, p. 271.)

F. ASPERELLA Sowerby. Pl. 31, fig. 23.

Shell ovate, somewhat attenuated anteriorly, rather depressed, radiately striated and obsoletely ribbed, roughened throughout with raised dots; orifice oblong-ovate; variegated with olive and red, rayed anteriorly with white. (*Rve.*)

Lobos Island, Peru.

F. asperella SOWB. P. Z. S. 1834, p. 127; Conch. Illust., f. 71.—REEVE, Conch. Icon. f. 58.—SOWB., Thes. p. 190, f. 56.

F. MONILIFERA Sowerby Jr. Pl. 58, fig. 28.

Shell oval, conic, rugose, with radiating alternately black and fulvous beaded riblets. Hole large, oval, somewhat narrowed in the middle. Internal callus with a red line. This must have been a beautiful shell in living condition, the alternate ribs consisting of

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minute regular black beads. A pink line defines the inner callus. The worn but still pretty specimen is in Mr. Hanley's collection. (*Sowb.*)

Habitat unknown.

F. monilifera SOWB. Thes. Conch. iii, p. 188, f. 175.

F. LONGIFISSA Sowerby Jr. Pl. 58, figs. 27.

Similar to *F. macrotrema* but vividly red rayed. Hole elongated, tripartite, narrow. Inside callus rose-bordered. The fissure of this brightly-rayed shell is so peculiarly long and narrow as to distinguish it from the preceding, which it otherwise resembles. (*Sowb.*)

Habitat unknown.

F. longifissa SOWB. Thes., p. 191, f. 66.—*F. macrotrema* var. Conchol. Illust., f. 41.

A specimen before me is from the Gallapagos Is. It is very closely allied to *F. macrotrema*.

F. OBSCURA Sowerby. Pl. 31, fig. 25.

Shell ovate-oblong, radiately costate, the riblets obtuse and rather wide. Inside greenish, margin undulating, crenulated, paler. Outside radiately painted with varied colors, a few black dots radiating around the hole. Hole subelongated, wider in the middle, the callus surrounding it inside bordered with red.

Length 1·1, width 0·7 inch. (*Sowb.*)

Gallapagos Is.

F. obscura SOWB. P. Z. S. 1834, p. 125; Conchol. Illust., f. 27.—REEVE, Conch. Icon., f. 46.—SOWB. Thes., p. 191, f. 80.

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Species from the East Coast of America and the West Indies.

F. NIMBOSA Linné. Pl. 36, fig. 32.

Shell long-ovate, elevated conical, the summit a little in front of the middle. Sculptured with more or less obsolete radiating riblets. Orifice oblong, a little contracted in the middle, from one-seventh to one-ninth the length of the shell.

The outline is long-ovate, a trifle narrower in front of the middle. Color grayish-pink, with eleven or more broad black rays. Inside light greenish, with a black line around the edge. The edge is thin and finely crenulated. Length 45, breadth 32, alt. 17 mill.

Carthagena, New Granada; Venezuela; W. Indies (?).

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Patella nimbosa LINN. Syst. Nat. x, p. 785.—*F. nimbosa* LAM. An. s. Vert. vi, 2d pt., p. 10.—REEVE Conch. Icon. f. 29.—SOWB. Thes. Conch. p. 192, f. 136.

Has more the aspect of the Chilian species than of the West Indian. It is a dark shell, obsoletely ribbed and rayed with black.

F. NODOSA Born. Pl. 37, figs. 46, 47, 48.

Shell conical, elevated, the base oval. Apex a little in front of the middle. Sculptured with strong nodose radiating ribs. Orifice oblong, more than twice as long as wide, contracted in the middle, one-seventh to one-ninth the length of shell.

The form is variable but usually much elevated. Unicolored, varying from brown to white. Ribs prominent, principal ones about 23 in number, but usually there are some small interstitial riblets also. These ribs are conspicuously nodose. Inside white; margin conspicuously dentate.

Length 36, breadth 25, alt. 17 mill.

Length 29, breadth 22, alt. 15 mill.

Tortugas; Florida Keys; Bermuda; West Indies generally south to Barbados.

Patella nodosa BORN, Test. Mus. Cæs. Vindob. p. 429, 1780.—*Fissurella nodosa* of LAMARCK, REEVE *et al.*, and of ARANGO, Fauna Mal. Cubana, p. 228.—DALL Prelim. Cat. Moll. S–E. U. S., p. 170.—*Patella spinosa* GMEL. Syst. Nat. xiii, p. 3731.—*Patella Jamaicensis* GMEL. l. c., p. 3730.

A very distinct form, known by the dumb-bell shaped porforation and strong nodose ribs.

F. BARBADENSIS Gmelin. Pl. 37, figs. 40, 41, 42, 43, 44, 45, 49; pl. 60, figs. 73, 74, 75.

Shell conical with oval or ovate base, the apex subcentral, pierced by a small orifice short-oval or almost circular in form. Surface sculptured with radiating ribs of which about eleven are generally stronger, continuing from perforation to the basal margin.

The form varies immensely, as the figures show. The primary ribs are sometimes very strong, sometimes scarcely more prominent than the others. The ribs are uneven, irregularly serrated in the more coarsely sculptured forms; in those with subequal, small riblets, the larger ones bear numerous erect, delicate scales. The color is grayish, grayish-green or grayish-pink, often blotched in the spaces between the ribs with purplish-brown. The inside has

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alternately green and white concentric rings, the perforation-callus being green, usually bounded by a brown line. Margin strongly crenulated.

Length 34, width 22, alt. 10 mill. (average specimen.)

Length 35, width 25, alt. 16 mill.

Length 37, width 24, alt. 9½ mill.

Charlotte Harbor, Florida, and Bermuda southward to Trinidad.

Patella barbadensis GMEL., Syst., p. 3729.—*Fissurella barbadensis* LAM., and of authors generally.—*Patella porphyrozonias* and *rosea* GMEL.—*F. antillarum* ORB. Moll. Cuba ii, p. 198, t. 24, f. 40–42.—*F. edititia* REEVE, Conch. Icon., f. 47.

One of the most abundant species of *Fissurella* throughout the West Indies. The very short orifice, more nearly round than in any other species, is diagnostic, varying less than usual. The form and sculpture of the shell is excessively variable. One delicate variety has erect scales upon the larger ribs, and is painted with ten or eleven rays composed of red lines.

F. edititia Reeve (pl. 30, fig. 4) is a pretty color-mutation, with the inter-liral spaces pink or red.

Var. SCHRAMMII Fischer. Pl. 60, figs. 77, 78, 79.

Shell depressed, oblong-ovate, decidedly narrower in front. Fissure small, oblong; radiately sculptured with 9 or 10 principal ribs and numerous interstitial riblets, the larger ribs projecting at the margins. Inside of a delicate green color, whiter around the middle, cream colored at the edge, the hole-callus brown.

Length 23, width 14, alt. 4½ mill.

Guadeloupe; St. Thomas.

F. schrammii FISCHER. Journ. de Conchyl. vi, p. 383, t. 11, f. 5, 6, 1857.

Var. INTENSA Pilsbry. Pl. 60, fig. 76.

Shell conical, long-ovate, chocolate colored, with some white rays around the nearly circular, small hole, the peripheral margin buff; radiating ribs very unequal, subsquamose.

Length 18, breadth 12, alt. 5½ mill.

Var. BERMUDENSIS Pilsbry. Pl. 60, figs. 70, 71, 72.

Shell elevated-conical, with ovate base; of a delicate green tint all over, or with reddish-brown lines in the narrow interstices between the riblets. Sculpture composed of numerous radiating rounded

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riblets, every fourth one a little larger. Fissure nearly round. Inside light green, having a dull reddish line around the central callus, and sometimes mottled with pink outside of the muscle impression. Border finely crenulated.

Length 21, breadth 15, alt. 8 mill.; number of radiating riblets about 60.

Length 16½, breadth 12, alt. 7 mill.; number of riblets 40.

St. Thomas; Bermuda.

The St. Thomas specimen is larger and has more riblets than those from Bermuda, and it is more variegated inside with pink. It is the one figured. The Bermuda shells, which may be regarded as typical, have the orifice a little larger. They were collected by Professor Angelo Heilprin.

F. ROSEA Gmelin. Pl. 62, figs. 19, 20, 21.

Shell conical, oblong-ovate, narrower in front, the apex a little in front of the middle of the shell. Sculptured with numerous unequal rounded radiating riblets, sometimes scaly. Grayish, having 10 to 12 broad red or purple rays. Perforation oval, small, its length one-ninth to one-twelfth the length of the shell.

The outline is about as in *F. nubecula* of European seas. Altitude quite variable, generally one-half the breadth or a little less. Ribs more prominent than in *F. nubecula*. Interior uniform green or with a white tract not extending outward as far as the muscle impression. Hole-callus bounded by a red line. Border a little crenulated. Muscle-impression rather wide, not distinct or impressed.

Length 26, breadth 16, alt. 8, mill.; length of hole 2½ mill.

Length 26, breadth 16½, alt. 6½, mill.; length of hole 2⅛ mill.

Length 24, breadth 15½, alt. 7, mill.; length of hole 2 mill.

Matanzas, Cuba; Vera Cruz, Mexico; Costa Rica; Guiana, and Rio Janeiro.

Patella rosea GMEL. Syst. Nat. xiii, p. 3730.—*F. rosea* LAMARCK, An. s. Vert. vi, 2d. pt., p. 12.—SOWB., Thes. Conch. iii, p. 190, f. 91, 92, 150.

This species seems to be abuudant along the coast of the mainland of America from Vera Cruz (Heilprin, 1890) southward to Costa Rica (Gabb), and specimens are also before me from Guiana and Rio Janeiro. I have above pointed out the differences between this species and the Mediterranean *F. nubecula* L. There is a

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variety in which the white rays bear much more prominent ribs (pl. 60, fig. 80, 81). This may bear the name of var. SCULPTA.

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Species of the Cape Verde and Canary Is. and adjacent Coasts.

The genus Fissurella is represented by numerous forms in the Cape Verde Archipelago, but specimens of them are rare in collections. It would be easy to throw a number of the species together, but synonomy made without the examination of large suites is less useful than an unprejudiced statement of the facts actually *known*. All of the species are here for the first time collocated into one group. They are doubtless connected by the bond of common ancestry. The group seems to have been derived, probably at no very ancient date, from the West Indian fauna.

The species stand thus in the order of publication:

1. *F. coarctata* King, 1831.
2. *F. afra* Q. & G., 1834.
3. *F. verna* Gld., Aug., 1846.
4. *F. alabastrites* Rve., Aug., 1849.
5. *F. glaucopsis* Rve., Aug., 1849.
6. *F. humphreyi* Rve., June, 1850.
7. *F. conioides* Rve., Aug., 1850.

F. HUMPHREYI Reeve. Pl. 39, fig. 4; pl. 60, figs. 88, 89, 90.

Shell conical, the base oval; white; sculptured with numerous (about 40) radiating ribs and riblets, very unequal in size, and more or less obviously nodulous. Summit a little in front of the middle. Fissure oblong, a little over twice as long as wide, somewhat contracted in the middle, and about one-seventh the length of the shell. Inside pure white; edge denticulate.

Length 28, breadth 20, alt. 10 mill.

Cape de Verde Is.

F. Humphreyi REEVE Conch. Icon. f. 85, June, 1850.—SOWB., Thes., p. 189, f. 61.

This form is very closely allied to the West Indian *F. nodosa*. The radiating riblets are, however, more unequal, and the altitude is less. It is similar to *F. alabastrites*, but has a smaller fissure and the ribs are swollen at intervals, making them nodose.

F. ALABASTRITES Reeve. Pl. 60, fig. 93.

Shell conical with oval base, summit a little in front of the middle; strongly radiately ribbed; orifice large, about one-fifth the length of shell, contracted in the middle.

The shell is white, sculptured with about 25 strong radiating ribs, not equal in size. The orifice is sole-shaped, having a dark line

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just within its edge, the two sides projecting upward and contracting it about the middle. Inside porcellaneous white, the perforation-callus bluish, bounded by a black line. Margin denticulated by the ribs of the outside.

Length 24, breadth 17, alt. 10 mill.

Santiago, Cape Verde Is.

F. alabastrites RVE. Conch. Icon., f. 27, 1849.—SOWB. Thes. Conch., p. 188, f. 43, 44.—*Cremides alabastrites Reeve*, ROCHEBRUNE, Nouv. Arch. du Mus. 1881, p. 271.

Diagnostic points are the large orifice, bounded by a dark line and contracted in the middle; the inside callus also bounded with black; and the strong ribs of the exterior.

F. COARCTATA King. Pl. 39, fig. 94.

Shell ovate, attenuated anteriorly, radiately very closely striated; orifice oblong, very much contracted in the middle; greenish-white, very closely rayed with black lines around the orifice. (*Rve.*)

Island of Santiago, Cape Verde Archipelago.

F. coarctata KING, Zool. Journ. v, p. 339, 1831.—SOWERBY in Conchol. Illustr., f. 22, 37.—REEVE, Conch. Icon. f. 32.—SOWB. Thes., p. 188, f. 60.—*Cremides coarctata King*, ROCHEBRUNE, Faune de l'Archip. du Cap Vert, in Nouv. Arch. du Mus. 2d. Ser. iv, 1881, p. 271.

A species allied to *humphreyi*, *alabastrites*, *verna*, and *glaucopsis*—species described from the Cape Verde Islands. Distinguished by its large bipartite orifice and fine radiating striæ.

Reeve gives *Benguela, W. Africa*, as the habitat. Rochebrune says that both recent and fossil specimens are in the Paris Museum.

F. VERNA Gould. Pl. 42, figs. 49, 50, 51.

Shell symmetrical, solid, depressed-conical, of a greenish-ash color, and broadly rayed with dark purple; apex nearly central, purple at tip; surface with a thin epidermis and with about 20 to 30 depressed, nearly equal flattish ribs, the intervening spaces of about an equal width, and subdivided by one or two striæ. Aperture regularly oval, edge coarsely scalloped. Interior of a pale verdigris or leek-green color. Fissure small, oval, surrounded interiorly with a finely striated callus margined with bluish. (*Gld.*)

Length 1⅛, breadth 1¼, alt. ½ inch.

Porto Praya, Cape de Verde Is.

F. verna GLD. Proc. Bost. Soc. N. H. ii, p. 155, Aug. 1846; U. S. Expl. Exped. Moll. & Shells, p. 366, f. 472*a*, *b*, *c*.

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The specimens before me are less rayed than Gould's. A small variety is described by him, as more solid, more elevated and rounded, externally cinereous, the ribs smaller and rounded, without radiating striæ and without purple rays, but sometimes with dots about the apex; outline arched-conical, fissure elongated. Interior very pale green, the internal callus sometimes surrounded with violet; margin crenated on a smaller scale. It is figured on pl. 60, fig. 83. I do not know whether this small form really belongs to *verna* or not. I have specimens before me from Teneriffe, Canaries.

F. verna belongs to a group of species comprising *F. glaucopsis, humphreyi, alabastrites, conioides* and *obtusa*. The form and size of the fissure is remarkably diverse in the several species.

F. AFRA Quoy & Gaimard. Pl. 59, figs. 36, 37.

Shell ovate-oblong, convex, buffish painted with brownish-violet rays, white within; longitudinal striæ obsolete; foramen oblong, compressed.

This species resembles the *F. nimbosa* of Lamarck, but is not the same. The summit is more elevated, and the aperture is more carried forward; there is also a difference in appearance. For the rest, it is ovate, conical, obtuse at summit; the fissure is ovate, contracted in the middle. It is very finely striated radiately, and marked in the same way with radiating bands of a violaceous-brown on a yellowish-white ground. The fissure is bounded with darker. (*Q. et G.*) Length 9, breadth 7, alt. 5½ lines.

St. Iago, Cape Verde Archipelago.

F. afra (*Fissurelle de Praya*) Q. et G., Voyage de l'Astrolabe, Zool., vol. 3, p. 336; atlas, t. 68, f. 5, 6. 1834.

Compare *F. verna* Gould.

F. GLAUCOPSIS Reeve. Pl. 38, fig. 67; pl. 60, figs. 91, 92.

Shell depressed, the base oval, summit a little in front of the middle; sculptured with about 21 principal radiating ribs, and the same number of smaller ones between them. Fissure small, oval.

The form is much more depressed than *F. alabastrites*, being more like *F. verna*. The color is pure white, with an eroded bluish tract just around the perforation. Inside white (or the most delicate tint of green), stained with black or purplish-black around the hole, which is encircled by a black line. Margin coarsely toothed.

Length 28, breadth 22, alt. 8 mill.

Cape de Verde Is.

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F. glaucopsis RVE. Conch. Icon. f. 28, Aug., 1849.—SOWB. Thes. p. 188, f. 45.

Allied to *alabastrites* in color, to *verna* in form and character of the fissure. It may prove to be a variety of the *verna*.

F. CONIOIDES Reeve. Pl. 38, fig. 79.

Shell ovate, elevately conical, thick, radiately corrugately ribbed, ribs very irregular and rugose; orifice ovate, central, white, ashy-black around the orifice, greenish in the interior. Closely allied to the *F. glaucopsis* and *alabastrites* from the Cape Verde Is. (*Rve.*)

Cape of Good Hope.

F. conioides RVE., Conch. Icon. f. 95, Aug., 1850.—*F. conoides* SOWB. Thes. Conch., p. 189, f. 51.

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Mediterranean and S. African etc., species.

F. NUBECULA Linné. Pl. 60, figs. 94, 95, 96, 97, 98, 99.

Shell conical, ovate-oblong, summit a little in front of the middle. Sculptured with numerous subobsolete, unequal radiating riblets. Grayish, with rays of dull purple. Fissure oblong, parallel-sided, its breadth two-fifths of its length. Inside white or bluish-white inside the muscle-impression, the rest of a delicate green shade. Hole-callus white or green, bounded by a brown line, which is often obsolete. Margin acute, a little crenulated.

The typical form is oblong, narrower in front, altitude not quite a half of the breadth; fissure oblong, about one-seventh the length of the shell; inside colored as above described, the muscle impression rather distant from the margin (in this respect differing from the South African species *mutabilis* and *incarnata*, which have the impression near the margin), and the scar is narrow, generally deeply impressed. The riblets of the outer surface are low, rounded, obtuse, often subobsolete.

Length 22, breadth 14, alt. 6½ mill.; length of hole 3 mill.

Length 25, breadth 15½, alt. 8 mill.; length of hole 3¾ mill.

Length 24, breadth 16½, alt. 7½ mill.; length of hole 3½ mill.

Mediterranean and Adriatic Seas; Atlantic Ocean from the Gulf of Gascogne and Mogador to Cape Verde Islands.

Patella nubecula LINN. Syst. Nat. xii, p. 1262.—*Fissurella nubecula L.* HANLEY, Ipsa Linn. Conch., p. 434, t. 4, f. 10.—WEINKAUFF, Conchyl. des Mittelm. ii, p. 394.—ARAD. et BEN. Conch. Viv. Mar. della Sic., p. 128.—BUQUOY DAUTZENBERG & DOLLFUS Moll. du

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Rouss. i, p. 438, t. 53, f. 11–14.—*F. rosea Gm.* PHIL. Enum. Moll. Sicil. ii, p. 91. and of some other authors, not of GMELIN.—*F. nimbosa L.*, SCACCHI, and PHILIPPI, olim.—*F. lilacina* O. G. COSTA Catal. Taranto, p. 42.—*F. viridis* COSTA, l. c., p. 43, t. 4, f. 1.—*F. cinnaberina* COSTA, l. c., p. 43, t. 4, f. 4.—*F. Philippii* REQUIEN, Coq. de Corse, p. 40.

The only Mediterranean species of true *Fissurella*, the others belonging to the genus *Glyphis*. It is rather variable in color and form, but is constantly separated from the West Indian *F. rosea* by the decidedly larger perforation and more obsolete ribbing. The similar South African species have the muscle-impression much nearer to the margin than it is in this form.

Varieties recognized by Messrs Buquoy, Dautzenberg and Dollfus are as follows: SQUAMULIFERA B. D. & D., radiating riblets bearing numerous projecting, imbricating scales. *Patras, Greece.* Color-forms LILACINA, VIRIDIS and CINNABERINA are sufficiently described by their names.

Dunker (Ind. Moll. Guin. infer.) has reported the species from Guinea.

F. MUTABILIS Sowerby. Pl. 39, figs. 2, 3.

The shell is ovate or long-ovate, rather thin, higher behind than before, more or less convex, and always sufficiently so that the sides from apex to base are not contracted as in *F. incarnata*, but are somewhat convex. The orifice is in front of the middle and usually slopes forward; it is always encircled by a rose-red border, narrower front and back, and widest in the middle. The edge is acute and finely crenulated, but generally rubbed smooth. The shell rests upon the entire margin, rarely the front end gaping or elevated a little. The muscle-impression lies near the margin, as in *F. incarnata*. The inner callus of the orifice is more or less rose-red. There are two color-varieties; a *banded* and a *marbled*.

The banded form has 12 or 13 reddish-brown rays, the white interspaces somewhat narrower; is somewhat thick, sculptured with radiating riblets, those on the white rays stronger than on the pink. Length 13, breadth 7½, alt. 3½ mill.

The marbled form is grayish or reddish, flecked with darker, very obscurely rayed around the orifice, or with a couple of white interrupted rays in the middle. This form is thinner than the other, more finely striated, more elongated. Length 17, breadth 9,

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alt. 4 mill. Transition forms connecting with the radiately painted specimens occur.

Table Bay, False Bay and the Natal Coast.

F. mutabilis Sowb. P. Z. S. 1834, p. 127; Conchol. Illust., f. 67, 70.—Reeve, Conch. Icon. f. 43 a, b.—Sowb. Thes., p. 190, f. 70, 79, 93.—Krauss, Die Südaf. Moll., p. 65.—*F. sagittata* Reeve, Conch. Icon. f. 34.—Sowb. Thes. Conch. p. 201, f. 83.

The above is mainly taken from Krauss who collected and examined great numbers. It is a very variable species, as I see by the few specimens before me. Sowerby considers *F. incarnata* a synonym.

I take *F. sagittata* Reeve to represent the second or marbled variety of Krauss. It is figured on pl. 30, fig 2. The shell is radiately striate; rayed with pink, and has dark arrow-shaped flecks and dots. Were it not for Krauss' insistence on the identity of the two forms of *mutabilis* I should consider them distinct species.

F. catillus Reeve. Pl. 30, fig. 5.

Shell oblong-ovate, rather thick, a little compressed at the sides, obscurely decussately ridged, ridges somewhat rude, almost faded; orifice ovate, rather large; pinkish, rayed with dull white. This specimen is unicolored around the base, which is not likely to be a character of the species. (*Rve.*)

Java.

F. catillus Rve., Conch. Icon. f. 91.—Sowb., Thes., p. 191, f. 81.

F. rota Reeve. Pl. 39, figs. 99, 100.

Shell ovate, rather depressed, radiately obscurely obtusely ridged, ridges decussated with concentric grooves; orifice elongately oblong, a little contracted at the sides; olive-brown, conspicuously white-rayed, rays blotched near the margin with brown; pink around the orifice. (*Rve.*)

Cape of Good Hope.

H. rota Rve. Conch. Icon. f. 79, 81, 1850.—Sowb. Thes. p. 191, f. 72.

F. tæniata Sowerby, Jr. Pl. 59, fig. 41.

In form resembling *F. mutabilis*, but without striæ and marked by eleven pairs of brown rays. (*Sowb.*)

Cape Verde Is.

F. tæniata Sowb. Thes. Conch., p. 191, f. 77.

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F. OBTUSA Sowerby. Pl. 38, fig. 61.

Shell ovate, rather elevated in the middle, radiately ribbed in a somewhat wrinkled manner; ribs irregular, interstices slightly impressed; aperture rather small, oblong, with the sides excavated. Rayed with pink and white, white rays narrow, conspicuous, pink rays broader, fading into light green near the margin. The pink coloring which forms the radiating bands of this species, appears only in the grooves of the sculpture, and has the appearance of fine lines. (*Rve.*)

Cape of Good Hope.

F. obtusa SOWB. Conch. Ill. p. 7, f. 59.—REEVE, Conch. Icon., f. 56.—SOWB., Thes., p. 189, f. 75, 76.—KRAUSS, Die Südaf. Moll. p. 66.

Krauss seems to regard this as synonym of *F. mutabilis*. I have not seen the species, and have taken both description and figure from Reeve. These should be compared with the original figures in the *Conchological Illustrations*, which show the hole of a very different shape.

F. NATALENSIS Krauss. Pl. 38, figs. 76, 77, 78.

The shell is almost always encrusted; eroded in the neighborhood of the apex, the sides straight, rarely a little convex. The bluish-black rays are unequal, being wider and more distinct on the front part than upon the posterior; and if the shell be held up toward the light they may be seen faintly from the inside. Of the 45 to 50 riblets, 10 to 12 are somewhat stronger than the rest, and these are usually situated in the white rays. All the riblets are little-raised, blunt, made a little rough by the irregular growth-lines, and scarcely project at the edge, which is consequently but slightly crenated. The side margins are a little concave, so that the shell rests upon the two ends only. The orifice is 2·5 lines long, 1 line wide, rounded and widest at the ends, narrowed somewhat on the sides, with two little teeth on each side. Interior smooth and white, the edge black and white, from the color of the outside, but not really margined. The muscle-impression lies about two lines from the edge. (*Krauss.*)

Length 16, breadth 9·5, alt. 5 lines.

Cape of Good Hope.

F. natalensis KRAUSS, Die Südaf. Moll., p. 66, t. 4, f. 8.—REEVE, Conch. Icon. f. 15.—SOWB. Thes. Conch. iii, p. 190, f. 69.

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F. OMICRON Crosse & Fischer. Pl. 22, figs. 45, 46, 47.

Shell of an oval, depressed form, ornamented outside by radiating ribs, crossed by fine concentric striæ, especially developed toward the summit, and giving that part of the shell a granular appearance. The intervals between the ribs are occupied by radiating striæ. The inside is smooth, shining, bluish-white. Margin simple, acute. Fissure oval, bordered within. (*Fischer.*)

Length 13, breadth 10 mill.

Saint Vincents Gulf, S. Australia.

F. omicron C. & F., Journ. de Conchyl. 1864, p. 348; *l. c.* 1865, p. 41, t. 3, f. 4–6.

Species of which the habitats are unknown.

F. OLIVACEA Gray. Pl. 59, figs. 51.

Shell ovate, scarcely attenuated anteriorly, rather conical, radiately somewhat irregularly roughly ridged, ridges obsoletely nodose; orifice oblong-ovate, slightly contracted in the middle; whitish, neatly rayed with olive. (*Rve.*)

Habitat unknown.

F. olivacea GRAY, SOWERBY's Conchol. Illust., f. 57.—RVE. Conch. Icon., f. 61.

F. BALANOIDES Reeve. Pl. 59, fig. 40.

Shell ovate, a little attenuated anteriorly, rather conical, smooth, radiately slightly grooved; orifice oblong-ovate, a little contracted in the middle; yellowish, sometimes faintly tinged with rose, rayed with olive and dark green, rays marked with lines of the color darker, greenish white around the orifice. (*Rve.*)

Habitat unknown.

F. balanoides RVE. Conch. Icon., f. 66.—SOWB. Thes., p. 192, f. 94.

Compare *F. nimbosa.*

F. MELVILLI Sowerby Jr. Pl. 59, fig. 29.

Shell oval, rather elevated, broad behind, slightly contracted in front; radiately closely ribbed, ribs very little raised, alternately larger; concentrically wrinkled; pale green, interior greyish-white.

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Orifice round, subcentral, margin slightly, irregularly wrinkled. Differs from its congeners chiefly in the rotundity of its orifice.

(*Sowb.*) Length 50, width 40, alt. 22 mill,

Habitat unknown.

F. melvilli SOWB. P. Z. S. 1882, p. 120, t. 5, f. 11.

Subgenus FISSURIDEA Swainson, 1840.

Fissuridea SWAINS. Malacology, p. 356. Type *F. pileus* Sw.=*F. pileopsoides* Rve.=*F. galeata* Helb.

The apex leans forward over the anterior end of the shell, in this section. The perforation is small, oval, opening *forward* rather than upward. The callus surrounding the hole inside is oval, with entire, not very distinct edges. Outer surface having radiating riblets, and fine concentric striæ.

Animal not observed.

F. GALEATA Helbling. Pl. 60, figs. 66, 67, 68.

Shell oval, elevated, the apex projecting anteriorly as far as or over the margin. Perforation small, oval, directed forward. Surface with radiating riblets decussated by finer concentric striæ. color white. Length 17, breadth 10½, alt. 8 mill.

Isl. of Masbate, Philippines.

Patella galeata HELBLING, Beiträge zur Kenntniss neuer und seltener Conchylien, in Abhandl. einer Privatgesellschaft in Böhmen zur Aufnahme der Mathematik, der vaterländischen Geschichte und der Naturgeschichte, Bd. iv, p. 103, t. 1, f. 3, 4, 1779.—VON MARTENS, in Malak. Blätter, xvi, p. 235.—*F. pileopsoides* RVE. Conch. Icon., f. 99, 1850.—*F. pileopsides* (*sic.*) SOWB. Thes. Conch. iii, p. 199, f. 120, 121.—*F. pileus* SWAINS. Malacol., p. 356 (teste H. & A. Ads.), not described.

A curious shell, having the summit hooked over the front margin. Since there is some doubt about which of the two names *pileopsoides* or *pileus*, should be used, it is certainly best to revert to the ancient one proposed by Helbling.

Subgenus CLYPIDELLA Swainson, 1840.

Clypidella Sw., Malacol. p. 356. Type, *F. pustula*, (Sowerby's Genera, *Fissurella*, fig. 3.).—*Clypidella*, in part, of authors.

The shell is short-oval, depressed, saddle-shaped, the two extremities elevated so that when standing on a plane the side margins

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alone support it. Surface radiately ribbed. Orifice long, narrow, dilated in the middle, bordered inside by an oval callus which is not truncated posteriorly. Edges crenulated.

The animal has been figured by A. Adams (Genera Rec. Moll.) and by Dr. Fischer (Journ. de Conchyl. vi, pl. vii). The former author has unquestionably made a mistake in the species; his figure does not represent *Clypidella pustula*. This blunder has mislead most subsequent investigators, causing them to give the group higher systematic value than its characters warrant. Fischer's figures show the animal to be very similar to the other species of *Fissurella*, comparatively small, and wholly covered by the shell, except the projecting head.

The animal with shell is shown on pl. 59, fig. 42; in fig. 43 it is seen from above with the shell removed; fig. 44, ventral aspect of the same. It is, says Fischer, quite flat, and in the contracted condition the free borders of the mantle do not extend to the edge of the shell by several millimeters; in the living state it is expanded, its fringe corresponding to the sinuosities of the shell-edge, but not reflexed up over the shell, which has epidermis and is often covered all over with marine incrustations. The mantle-edges are double, ornamented with little tubercles; the upper edge is very regularly crenulated, corresponding with the depressions in the edge of the shell; the lower edge has fine papillæ throughout its length. Anal orifice oval, elongated, pretty large, membranous; its edges not digitated nor formed into a siphon; muscle-impression extending far forward, narrow, rounded at its anterior extremity. The two ends are united by a narrow, horizontal transverse muscle band, lacking in other species. The head is robust, elongated, extending in front of the shell when alive. Tentacles thick and short; mouth forming a vertical slit. Foot exactly oval, a little wider behind, quite thick, perceptibly rugose above, but not having tubercles large enough to be seen on a design of natural size. Epipodial row of tubercles present.

F. PUSTULA Lamarck. Pl. 59, figs. 42–47.

Shell rounded-oval, depressed, truncated in front; margin sinuous, elevated in front and behind; orifice cross-shaped, situated at the front third of the shell, bounded by a red line.

The outline is oval, more or less truncated in front, much depressed, the altitude contained about four times in the length. The color is usually buff with short red rays around the perforation,

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but specimens of a white or crimson color occur, still having, however, the short white flames around the orifice. The sculpture consists of numerous radiating riblets separated by narrow grooves; these riblets being smaller in front. Inside white, with a red line bounding the perforation-callus; edge crenulated.

Length 20, breadth 17, alt. 5 mill.

Cape Lookout to Barbados.

F. pustula LAMARCK, An. s. Vert. vi, 2d pt., p. 14, 1822; and of subsequent authors.—Not *Patella pustula* LINN., Syst. x, p. 784, an unrecognizable species of *Glyphis.*

A well-known species, inhabiting Cuba, St. Thomas, St. Croix and the West Indies generally, recently reported by Dall from the region of Hatteras. It is readily seperable from *F. fascicularis* by the more anterior position of the orifice, and the shorter shell, obviously truncated in front.

✔ F. FASCICULARIS Lamarck. Pl. 37, figs. 59, 60; pl. 59, figs. 48, 49, 50.

Shell oval, depressed, not truncated in front; margin sinuous, elevated in front and behind; orifice cross-shaped, separated from the front margin of the shell by double its own length or more.

This shell has the same saddle shape as the preceding, but is less truncated in front. The radiating riblets (usually about 47 in number) are coarser; they are slightly cut by concentric striæ. The color is usually crimson-red, the interstices whitish; darker rays when present, not conspicuous. Inside white or tinged with pink, the perforation-callus sometimes bordered by a red line. Edge crenulated. Length 30, width 22, alt. 6–8 mill.

Florida Keys to Porto Rico and Jamaica.

F. fascicularis Lam. An. s. Vert. vi, 2d pt., p. 14.—REEVE, Conch. Icon., f. 59.—ARANGO, Fauna Mal. Cubana p. 228.—SOWB. Thes., iii, p. 204, f. 212–214.—*Clypidella fascicularis* Lam., DALL, Prelim. Cat. Moll. S–E. U. S. p. 173.

More oval than *F. pustula,* and having the fissure nearer the center.

Dall (*l. c.*) places this species in *Clypidella,* but separates *F. pustula* under *Fissurellidea. F. pustula* is, however, the type of *Clypidella!*

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Subfamily II. FISSURELLIDINÆ, Pilsbry.

Animal much too large to be included in the shell, even when contracted in spirit. Rhachidian tooth far broader than the laterals, not narrowed above. Shell with the apex removed by a large perforation, which is bounded inside by an entire, not truncated, callus rim.

It is not improbable that *Macroschisma* and *Lucapinella* will be found to belong elsewhere; in this case, the subfamily will be restricted to the forms included under my first division in the conspectus of genera.

The shells of this group may generally be recognized by the large perforation, gaping extremities, and entire, not truncated, hole-callus.

I have used shell-characters as largely as possible in the following analytical table, which represents, however, the natural grouping of the forms as I understand them.

Conspectus of Genera.

I. Mantle wholly or in part covering the shell, and enveloping the foot; its border without papillæ.

A. Shell with a white rim or border above; very small in proportion to the animal; mantle extending far beyond the foot on all sides.

a. Edge of shell rounded; mantle-margin thickened. Genus FISSURELLIDEA, Orb.

b. Edge of shell grooved, acute; mantle margin thin. Genus PUPILLÆA, Gray.

B. Shell not white-bordered above, more than half the length of the animal; mantle extending but little beyond the borders of the foot.

a. Edges of shell nearly in a plane, finely crenulated, the ends not elevated. Genus LUCAPINA, Gray.

b. Edges of shell elevated at each end, blunt at the sides, in adults not crenulated. Genus MEGATEBENNUS, Pils.

II. Mantle not enveloping either shell or foot, the latter large and fleshy, produced posteriorly beyond the shell; shell with the posterior margin more or less elevated, sides and front margin in a plane.

A. Apex of shell posterior, removed by a large triangular fissure, the wide end of which is very near the posterior margin of shell; tentacles long, subulate. Genus MACROSCHISMA, Sw.

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B. Apex subcentral, perforation the shape of the shell; tentacles short, blunt. Genus LUCAPINELLA, Pils.

Genus FISSURELLIDEA s. str.

Fissurellidea ORB., Voy. dans l'Amér. Mérid., p. 447. Type, *F. megatrema* Orb.=*hiantula* Lam., not of authors.

The oblong shell is nearly covered by the mantle; its edge is thickened, rounded, with a white rim above. The fissure is very large, subcentral in position.

Animal much larger than the shell; mantle thickened at its borders, much exceeding the foot in size. The latter bears a row of epipodial papillæ along its sides. Dentition unknown.

But one species of the genus as here restricted is known.

F. HIANTULA Lamarck. Pl. 43, figs. 89, 90, 91, 92, 93.

Shell oval, thin, depressed, nearly smooth, whitish, radiated with purplish; inside white; margin thickened; foramen oval, large, (two-fifths the length of shell), broadly margined within. (*Orb.*)

Length 29, alt. 5 mill.

Ensenada de Ros, on the coast of Patagonia, 15 leagues south of the Rio Negro.

Fissurella hiantula Lam., An. s. Vert. vi, pt. 2, p. 14, 1822.—*Fissurellidea hiantula* H. & A. AD. Gen. Rec. Moll. i, p. 449 (not *F. hiantula* of Reeve, Sowerby, *et al.*).—*Fissurellidea megatrema* ORB. Voy. dans l'Amer. Mérid. p. 477, t. 63, f. 5–10.—*Fissurella aperta* Sow., REEVE, Conch. Icon., f. 39.

Animal, according to Orbigny, very large, fleshy, coriaceous, depressed. Mantle very large, smooth above, strongly thickened at the edges; it encloses the shell almost completely. Foot not so large as the mantle, oval, a little acuminated behind. Head very voluminous, with a very fleshy muzzle, the tentacles short, compressed, obtuse, bearing the eyes at their bases. Between the foot and the mantle there is a row of little papillæ. The sole is of a blue color, the rest yellowish.

This is unquestionably the true *hiantula* of Lamarck, agreeing with his description, and with the figure in Born's Test. Mus. Cæs. Vindob., p. 414, vignette fig. F. The shell identified as "hiantula" by Reeve and others is quite a different form, having no resem-

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blance to Born's vignette cited by Lamarck. See also under *F. scutellum* Gmel. H. and A. Adams confused an oriental species with this under the name of *F. hiantula.*

Genus PUPILLÆA (Gray) Krauss, 1848.

Pupillia GRAY, Synops. contents Brit. Mus. 42d edit., p. 151, 1840 (only a name; no description or type indicated); Guide Syst. dist. Moll. Brit. Mus., pt. 1, p. 167, 1857.—*Pupillaea Gray*, KRAUSS, Die Südafric. Moll., p. 62, 1848.—SOWB., Thes. iii, p. 204.

The shell is completely covered by the mantle, its edge white, sharpened and grooved; aperture very large, a little back of the middle.

Animal much larger than the shell, covered above with a leathery mantle, thin at its edges; foot much smaller than the mantle, tuberculate and wrinkled. The nature of the epipodial ridge and dentition is not known.

Gray neither defined the group or specified what species belonged to it in 1840. Sowerby says that he mentions it in the appendix to Beechey's Narrative, but I have not been able to find it there.

P. APERTA Sowerby. Pl. 44, figs. 6, 7, 8; pl. 62, fig. 9.

Shell oblong-elliptical, solid, convex, less so in front than behind; a little elevated or "gaping" at the ends, but not nearly so much as *F. scutellum* Gray; very prettily waved-striate concentrically and finely radiately ribbed. The riblets are very close, and are narrow and somewhat elevated in front and behind, but on the sides are again as broad and rather flat. The orifice is very large, long-elliptical, its edges rounded, and is situated a little behind the middle of the shell. The edge of the shell is double, consisting of the upper layer, which is colored and ribbed outside, and the inner layer, smooth and white, projecting a millimeter beyond the outer layer, upon which the animal is fastened by a thin coat. This peculiarity, which serves to distinguish the shell from that of *Fissurella*, may serve as an additional generic character. The shell is bluish-gray with 6 dirty reddish-brown broad rays, and several lines, sometimes interrupted, of the same color. Inside white and shining. (*Krauss.*)

Cape of Good Hope.

Fissurella aperta SOWB. Catal. Sh. Coll. Tankerville, appendix, p. vi, 1825.—*F. hiantula Lam.*, SOWB. Conchol. Illustr., f. 10 (not *F. hiantula* LAM.!).—*Pupillaea aperta Gray*, KRAUSS, Die Südafric.

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Moll., p. 62, t. 4, f. 11.—Sowb. Thes. iii, p. 204, f. 228, 229.—*Pupillia apertura* Gray.—Not *F. aperta* Reeve.

This shell may be recognized by the peculiarity of the margin, the inner layer projecting at the border beyond the outer, forming a narrow, white ledge. The sculpture of fine concentric striæ over radiating riblets, is shown in fig. 7 of pl. 44. I have been unable to find the description of *P. aperta* in the appendix to Beechey's Voyage.

Krauss describes the animal thus: The animal has the size and form of *Onchidium peronii* Cuv., is oval-elliptical, strongly convex, spreading out near the margins, smooth, covered with a leathery skin, whitish, perhaps also reddish-gray, with many unequal black flecks. Above, a third part from the front, there is a small hole, only 4 mill. long, in the depth of which, exactly as in Fissurella, there is a thick membrane pierced by a round opening, which serves as a gill-hole through the fissure in the shell. The shell is completely covered by the leathery skin, so that one must cut through it to extract the shell. The head lies several lines within the expanded front border of the mantle, and has two short tentacles, scarcely reaching as far as the end of the snout. The mantle-margin is thin, and much broader than the wrinkled and granulated foot.

Genus LUCAPINA Gray, 1857.

Lucapina Gray, Synops. Brit. Mus. 1840, p. 151 (no diagnosis or species mentioned); Proc. Zool. Soc. Lond. 1847, p. 147 (*Fissurella aperta* Sow. and *Lucapina elegans* Gray mentioned); Guide to the Syst. Distrib. Moll. Brit. Mus., p. 166, 1857 (the genus for the first time diagnosed, *L. cancellata* and *L. crenulata* mentioned).—*Lucapina* of P. P. Carpenter and American authors generally. Not *Lucapina* H. & A. Adams, Genera Rec. Moll. i, p. 447, 1858.

There seems to have been the greatest indecision in Gray's mind as to which group of the Fissurellidæ he would attach this name. He finally decided on the West American species in 1857. It should be noted that *Lucapina* of the brothers Adams is the same as *Glyphis* Cpr.

Shell large, oblong-oval, imbedded in the mantle, but large enough to cover most of the upper surface of the animal; apex a little in front of the middle, entirely removed by the large oval perforation; edges of shell not thickened, very regularly and finely crenulated at all

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stages of growth; internal callus-rim of perforation somewhat excavated posteriorly in young shells.

Animal black, "like India-rubber," the finely granulose mantle covering the shell in life, its edges smooth, thinned, not papillose; border of dorsal pore simple, not papillose. Foot (in alcoholic specimens) extending posteriorly a short distance beyond mantle, encircled by a row of short papillæ borne on a low epipodial ridge. Tentacles long, pointed, clavate, eyes on prominent rounded peduncles behind them.

L. CRENULATA Sowerby. Pl. 44, figs. 95, 96.

Shell very large, light buff or stained with grayish, the surface radiately striate, obscurely decussated by growth-lines and wrinkles. Edge very regularly and finely serrated; interior white; muscle-scar broad, not impressed. Perforation large, oval, a little in front of the middle. Length 120, breadth 78, alt. 23 mill.

Monterey to San Diego, Cal.

Fissurella crenulata SOWB. Catal. Tankerville, Appendix, p. vi, 1825; Conchol. Illust., f. 31.—REEVE, Conchol. Icon., f. 18.—*Lucapina crenulata* of Carpenter and others.—*Megathura Californica* NUTTALL MSS.

For account of animal and dentition see Dall, Amer. Journ. Conch. 1872, p. 131.

This is the largest of the Fissurellidæ, and in its great size and beautifully crenulated border is one of the most distinct.

See under *Glyphis* for certain points in which some species of that genus and this seem to approach.

Genus MEGATEBENNUS Pilsbry, 1890.

The small species grouped under this name agree with *Fissurellidea* (as restricted to Orbigny's type) in having a partially internal, large-apertured shell, a mantle ample enough to cover the entire dorsal surface of the foot and head, its edges entire; they differ from *Fissurellidea* in the much greater proportional size of the shell, more elevated body, the foot (viewed ventrally) almost as extensive as the mantle, the margin of the latter not at all thickened, and the shell not white-bordered above.

F. bimaculata Dall may be considered the type.

In the specimen examined by me, the very densely and minutely granulate mantle envelopes the entire head and upper surface of the

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foot, and extends upward well over the margins of the shell. Its edges, both above and below are smooth, thin. The epipodial ridge is a simple raised line. The dorsal pore has no papillæ or processes around it.

The specimen having been long in alcohol was much contracted and of a uniform brown color. It is drawn on pl. 61, Fig. 11 representing a side view of animal with shell.

Fig. 10 ventral aspect of foot, showing the head enveloped by the mantle.

Fig. 12 mantle cut away to show head with tentacle and eye, and beginning of the epipodial ridge.

Compare Dall's description of *F. bimaculata.*

M. BIMACULATA Dall. Pl. 44, fig. 94.

Shell ellipsoidal when young, subquadrangulate and a little narrower in front than behind when adult. Aperture the same shape as the shell, slightly encroached upon in some specimens by a point on each side. External surface furnished with radiating rounded costæ, widening slightly toward the margin; these are crossed by evident but not very strong lines of growth, which in some individuals are rather strong. Anterior declivity of the shell concave, sides flattened, posterior declivity rounded convex. Color whitish with numerous radiating rays of brown or slate color, usually with a broad fasciculus of darker rays in the middle of each side extending from the apex to the margin, and occasional dark dots on the ribs. Shell occasionally entirely brown or slate-color, with two darker rays on the sides. Epidermis none. Interior pure white, the two dark rays sometimes showing through the shell. Extreme outer edge finely denticulate or rounded and smooth according to the stage of growth. Margin as a whole broad, smooth, differentiated from the rest of the surface by a wide shallow groove. Margin of the aperture similarly bordered. Muscular impressions distinct, surface marked by fine radiating lines; polished. Anterior and posterior margins internally concave or emarginated, so that when laid upon a flat surface in the natural position the ends of the shell do not touch it. (*Dall.*) Length 16, breadth 10, alt. 3¾ mill.

Monterey, Baulinas Bay, Santa Barbara, Purissima, and Lobitas, Cal.

Fissurellidea bimaculata DALL, Amer. Journ Conch. vii, p. 132, t. 15, f. 7, 1872.—*Clypidella bimaculata* DALL ms.

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Dr. Dall's original description is given. The external anatomy is described by him in the place cited above. The epipodial line has papillæ, according to him; so it is likely that my specimen was deficient or imperfect, perhaps from too long remaining in alcohol. It is described above.

Section AMBLYCHILEPAS Pilsbry, 1890.

Large-fissured Fissurellidæ with a saddle-shaped shell, elevated at the two ends, its margin thickened, blunt, not crenulated and without a white border or rim above. The perforation oblong or oval, subcentral. Type *F. trapezina* Sowb.

The animal is not known. The excessively unsatisfactorily condition of our knowledge of the animals of the Fissurellidæ renders systematic work with the shells alone very uncertain. It has seemed to me necessary to institute this group in order to have a place for the following oriental species, which have a somewhat different aspect from the West American *Megatebennus*.

M. scutellum Gmel. (*hiantula auct.* not of Lam.) is probably equally typical of the group with the *trapezina*.

From *Clypidella* the shells of this genus are separated by the much wider, subcentral (not anterior) orifice, non-crenulated margin, etc.

M. SCUTELLUM Gmelin. Pl. 39, fig. 89; pl. 44, figs. 99, 100, 1, 2.

Shell oblong-oval, low-conical, compressed at the sides; perforation a little in front of the middle, rather large, oval, about one-fifth the length of the shell. Color grayish, with broad rays of purple or red.

The outline is oblong; in front and back more or less convex, compressed and flattened along the sides. The margin at both ends is strongly raised, so that when placed on a plane the sides alone support it. It is sculptured with very numerous close radiating riblets, subobsolete concentric growth-lines, and generally has the positions of one or two former peristomes marked by slight ledges. Inside white or nearly so, having a rather wide callus margin around the perforation. Muscle-scar deeply impressed, very near the edge, its anterior extremities connected by a deep, curved muscle-impression. Margin blunt, not crenulated.

Length 34, width 21, alt. 10 mill.

Cape of Good Hope.

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Das Durchbohrte Schildchen MEUSCHEN, Conchyliologische Briefe, in Der Naturforscher, 18te Stück, p. 11, t. 2, f. 3, Halle, 1782.—*Patella scutellum* Gmel. Syst. Nat. xiii, p. 3731.—*Fissurella scutellum* Gray, KRAUSS, Die Südaf. Moll. p. 63, 64.—*Fissurella hiantula* Lam., REEVE, Conch. Icon., f. 36, Aug. 1849.—*Fissurellidea hiantula Lam.*, SOWB. Thes. Conch., iii, p. 202, f. 193, 194, 195.—*F. hiantula* of some other authors, but not of Lamarck, nor of H. & A. Adams.

The confusion in the books is so great that no course seems open except an appeal to the original authors. Gmelin cites only one figure for his *Patella scutellum* (exclusive of varieties); that one is Meuschen's excellent and unmistakable illustration, with which the brief description also agrees, and which represents the *F. hiantula* of Reeve and others. This is not the *F. hiantula* Lam., for Lamarck refers to Born's vignette (Test. Mus. Cæs. p. 414, fig. F.) as an illustration of his shell. This vignette represents *F. megatrema* Orb. (Note especially the characteristic white border!):—Certainly not the *hiantula* of Reeve and modern authors. Sowerby (Conchol. Illust.) refers *hiantula Lam.* to *Pupillia aperta*—a wholly improbable supposition.

M. CHEMNITZII Sowerby. Pl. 36, fig. 90.

Shell ovate, attenuated anteriorly, rather depressed, peculiarly compressed at the sides, lifted at the extremities; radiately ribbed, ribs rugged, unequal, obsoletely nodose, rather swollen here and there; orifice large, oval; stained and rayed with olive-green and purple-rose. (*Rve.*)

Benguela, West Africa.

F. chemnitzii SOWB., P. Z. S. 1834, p. 126; Conchol. Illust., f. 55.—REEVE, Conch. Icon., f. 1.—*Fissurellidea chemnitzii* SOWB. Thes., p. 202, f. 29, 192.

M. SELLA Sowerby Jr. Pl. 62, fig. 8.

Shell short, narrowed in front, sides a little compressed, ends much elevated; fulvous-reddish, minutely striated, grayish inside; margin smooth, circumscribed by a purple callus. An interesting saddle-shaped shell, which has the pinched-up character of *F. hiantula* [=*F. scutellum* Gm.] etc., but is much shorter. It has the ends raised more than any other species. (*Sowb.*)

South Africa.

Fissurellidea sella SOWB. Thes., p. 203, f. 297.

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M. COMPLANATA Sowerby Jr. Pl. 62, fig. 13.

Shell oblong, depressed, white, ends a little elevated, with impressed radiating lines and concentrically most minutely striated; inside with thickened crenulated margin, circumscribed by a wide callus; foramen large, oval, central. A thick shell, with ends slightly elevated and very large fissure. (*Sowb.*)

East coast of Africa.

F. complanata SOWB. Thes. Conch. iii, p. 203, f. 201.

M. FLORESCENS Sowerby Jr. Pl. 62, figs. 14, 15.

Shell oblong, thin, narrowed in front, subdepressed, the ends a little elevated, concentrically undulately striated, radiated with depressed, unequal riblets; reddish-brown, variegated with red, white inside. Margin crenulated, rosy, perforation-callus rose-margined; foramen large, a little below the middle. A very pretty shell in Mr. Hanley's collection, in some respects resembling *F. chemnitzii*, but much thinner and not so much pinched at the sides or elevated at the ends. (*Sowb.*)

Habitat unknown.

F. florescens SOWB. Thes., p. 202, f. 202, 203.

M. INCARNATA Krauss. Pl. 35, figs. 4, 5.

The shell is ovate-oblong, usually of equal width in front and behind, rarely narrower in front, thin, sometimes depressed, sometimes convex, rose-red, marked with dark or reddish-brown bands and flecks. The radiating striæ are very fine, distinct and rather equal, quite so in a few specimens. The orifice is a little back of the middle, oblong, of equal width (in the figured specimen measuring, length 1·8, breadth ·8 lines), whitish or grayish on its outer edge. The edge of the shell is, in well-preserved specimens, very sharp and finely crenulated, but often is worn and smooth. The shell gapes strongly at both ends, and when standing on a plane, rests only upon the middle of the side-margins. Inside it is shining, white or pale rose, somewhat darker at the periphery, the perforation-callus edged with gray. The muscle-impression is distinct, and lies about a millimeter from the margin.

The proportion of breadth to length varies much.

Length 7·8, breadth 4, alt. 1·8 lines. (*Krauss.*)

Length 7, breadth 4, alt. 1·9 lines.

Length 6·6, breadth 4·2, alt. 1·6 lines.

Table and False Bays, Natal.

F. incarnata KRAUSS, Die Südaf. Moll., p. 65, t. 4, f. 7.

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This species is thinner, more finely striated than *F. scutellum* Gmel. and has proportionately far smaller orifice.

It is separated from *F. mutabilis var. sagittata* by the form of the shell-edge, which is curved at the ends, so that the shell rests on the side-margins alone when placed upon a plane surface.

M. NIGRITA Sowerby. Pl. 44, figs. 97, 98.

Shell oblong-oval depressed, the orifice nearly central or a little behind the middle, large, oblong, nearly one-third the length of the shell. Surface finely radiately striated and with uneven growth-striæ; dark brown in color, obscurely rayed with darker.

The form is oblong, both extremities decidedly elevated, so that the shell rests upon the sides when standing upon a plane. The color is "dark ash-brown, obscurely black-rayed." The inside is bluish; orifice surrounded by a narrow marginal callus; edge of shell blunt, smooth. Length 14–16, breadth 9½, alt. 4 mill.

South Australia; Tasmania.

F. nigrita SOWB. P. Z. S. 1834, p. 127; Conchol. Illust., f. 47.—REEVE, Conch. Icon., f. 41.—SOWB. Thes. Conch., iii, p. 203, f. 196.

A dark colored species, elevated at both ends, with larger perforation than *F. scutellum* Gm. (*F. hiantula* Auct.), and a narrower marginal callus around the perforation. It is less compressed at the sides than most *scutellum*.

M. CONCATENATA Crosse & Fischer. Pl. 22, figs. 40, 41, 42.

Shell oval, depressed, without radiating ribs, very slightly compressed laterally, ornamented all over the outside with an elegant pattern of little rounded pits, becoming oval near the margins. Perforation large, oblong, a little over one-fifth the length of the shell.

The outline is oval, depressed; color pure white; sculpture looking like the base of a honeycomb, but the pitting somewhat irregular usually. Inside with a narrow callus rim around the perforation; muscle-impression not impressed, close to the margin. The shell is rather thin.

Length 15, breadth 10½, alt. 3½ mill.

Length 18, breadth 13 mill.

Port Lincoln, S. Australia, and Lake Macquarie, N. S. Wales.

Fissurella concatenata C. & F. Journ. de Conchyl. xii, 1864, p. 348; *l. c.* 1865, p. 41, t. 3, f. 1–3.—ANGAS, P. Z. S. 1865, p. 184.

The peculiarly pitted surface is highly characteristic.

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M. TRAPEZINA Sowerby. Pl. 62, figs. 10, 11, 12.

Shell short, quadrate, the angles rounded, fissure a little in front of the middle, rather large, elliptical, one-fifth the length of the shell or a little more; concentric striæ fine, regular, more obvious than than the radiating ones. Color a light fawn tint, rayed with brown.

The outline is unusually square in adult shells (but the half-grown are oval), the front margin being abruptly truncated, and strongly arched upward. The posterior end is broadly rounded, and also a little curved upward. The surface is sculptured all over with beautifully fine and regular concentric striæ, decussated by equally fine radiating striæ, scarcely visible except near the summit. The color is a very delicate fawn or cream, upon which rays and lines of light, but rich brown, radiate toward the margins. Inside of a rather soiled white, the perforation bordered by a strongly defined callus, which is bounded by a roughened tract. The muscle-impression is very deep, close to the edge of the shell, its enlarged anterior extremities connected by a roughened scar. The edge of the shell is blunt. Length 25, breadth 20½, alt. 7 mill.

Guichen and Holdfast Bays, S. Australia; Tasmania; New South Wales, Australia.

✓ *F. Javanicensis* LAMARCK, An. s. Vert. vi, pt. 2, p. 14.—*Delessert*, Rec. de Coq., t. 24, f. 8.—*F. trapezina* SOWB. P. Z. S. 1834, p. 126.—*F. scutellum* (GRAY in coll. Brit. Mus.) SOWERBY, Conch. Illustr., p. 5, f. 34.—*F. scutella* Gray, REEVE, Conch. Icon., f. 33.—*Fissurellidea scutella* G. B. SOWB. JR., Thes. Conch. iii, p. 203, f. 207.—ANGAS, P. Z. S. 1878, p. 868. (not *Patella scutellum* GMELIN).—*Fissurella tasmaniensis* BONNET, Rev. et Mag. de Zool., 2d ser. xvi, 1864, p. 72, t. 6, f. 5.

A squarish species, much shorter than *F. scutellum* and beautifully striate concentrically. The coloration is peculiar.

This shell was first described by Lamarck, and should perhaps bear the name imposed by him. I have rejected it because the species does not occur within a thousand miles of Java, and because he described a young shell. Sowerby's *F. Javanicensis* (Conch. Illust., f. 12) is quite a different thing, probably a form of *F. scutellum* Gmel. The locality given by some authors, Cape of Good Hope, requires confirmation.

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Genus MACROSCHISMA Swainson, 1840.

Macrochisma SWAINS., Malacol., p. 356, 1840; type, *M. hiatula* Sw., (Sowerby's Genera, *Fissurella*, fig. 5).—*Macroschisma* of most authors.

Generic characters.

Fissurellidæ with an oblong shell not at all covered by the mantle, and much shorter than the long fleshy foot, its apex near the posterior margin, wholly removed by a large subtriangular fissure the wider end of which is very close to the posterior end of the shell.

The shell is situated on the front part of the body, the mantle extended a little in front of it. Tentacles long, subulate, the eyes on slight swellings at their outer bases. Epipodial ridge wholly obsolete. Anal tube rather long, directed backward.

Species distributed from Tasmania to Japan.

The more obvious characters are the large fissure close to the hinder end of the shell, margined inside by an entire narrow callus, and the posterior position of the vertex.

Swainson described Macroschisma as a subgenus of Fissurella. The brothers Adams (*Gen. Rec. Moll.* i, p. 449) consider it a genus; they commit the absurd error of mistaking the *back* for the *front* end of the shell—an error immediately detected by a glance at the muscle impression inside. Gray, Sowerby, and even our model systematist Fischer, all say that the perforation is close to the *anterior* end! all of which goes to show how a book-maker depends upon his predecessors.

Fischer, in classing *Macroschisma* under *Fissurella* as a subgenus, is clearly in error. The group constitutes one of the most distinct genera of *Fissurellidæ*.

Macroschisma has been monographed by Arthur Adams, Proc. Zool. Soc. London, 1850, p. 202, (8 species) and by G. B. Sowerby Jr.; Thesaurus Conchyliorum, vol. iii, p. 205, (12 species). The last monograph is valuable for its illustrations of Adam's unfigured species, but none of the published descriptions are worth much. Sowerby seems to have wrongly identified a number of forms (*M. hiatula* Swains., for example), and for this reason I have omitted referring to the Thesaurus in some cases. Thirteen species are described herein, but some of them will doubtless prove synonyms.

The animal pl. 59, fig. 59, of *M. sinensis* is thus described by Arthur Adams: Animal very large and elongated, bearing the shell

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in a sloping direction obliquely upwards on the fore part of the body. The tentacles are filiform and very long; and the eyes large, black, and conspicuous, are on slight swellings at their outer bases. The front edge of the mantle is extended, and gives the appearance of a large veil over the head. The mantle is not developed, nor does it cover the shell as in some members of the *Fissurellidæ*, and neither the mantle margin nor the anal tube is fringed. The edge of the mantle is furnished with short papillæ, four on each side and two behind, which are recurved over the edge of the shell. The anal tube is elongate and cylindrical, and is directed backwards and a little upwards through the foramen in the shell. The foot, large and fleshy, is produced behind and tapers to a point. It is ovate in outline, and the sides are simple, and not furnished with cirri or papillæ.

In progression the form of the foot varies considerably, sometimes being greatly dilated at the sides, and at others extended in front and contracted and pointed behind. The tentacles are red; the eyes black with a light areola; the body is light brown, lineated with darker brown.

Species.

M. SINENSIS A. Adams. Pl. 59, figs. 56, 57, 58, 59.

Shell oblong, the length a little exceeding twice the width, elevated, the altitude about one-fourth the length. Lateral margins a trifle convex, subparallel. Surface seen under a lens to be all over exquisitely latticed by clear-cut radiating and concentric striæ. Perforation narrow, long, somewhat wider posteriorly, about one-third the length of the shell. Color grayish-white, with one or two broad radiating brown bands on each side.

The peristome in this species is curved upward both in front and behind, but decidedly more so in the rear. The outline is quite blunt at the ends, especially posteriorly. The color of adults is a dull whitish, with a broad brownish ray extending toward each corner of the shell, the posterior pair arising from about the middle of the perforation. This fissure is very narrow, its greatest breadth scarcely a fourth of its length; it is scarcely dilated posteriorly, but as in the other species the margin is excavated there. Inside whit-

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ish, obscurely showing the dark rays of the outer surface; perforation margined by a narrow callus.

Length 10½ breadth 5, alt. 2½ mill.

Tabu-sima, Japan; China Seas; Singapore.

M. sinensis A. AD. P. Z. S. 1855, p. 122.—SOWB. Thes., p. 205, f. 219.—A. AD. P. Z. S. 1867, p. 312, t. 19, f. 28 (animal.)

A beautifully clathrate species, the concentric raised striæ being equally as elevated as the radials, but narrower. Some specimens have only one pair of broad rays, the anterior pair being absent. There is sometimes a pink tint on each side of the fissure.

M. WELDII Tenison-Woods. Pl. 59, figs. 33, 34, 35.

Shell lengthened (the length a little exceeding twice the breadth), elevated (the altitude contained about 4½ times in the length); lateral margins nearly straight, but a trifle convex; surface finely radiately ribbed, the riblets subequal, but occasional ones are a trifle larger; growth-lines fine, irregular. Perforation obtusely wedge shaped, its length contained five times in the length of the shell. Color grayish, closely speckled and suffused with black in more or less distinct rays; lighter around the edges.

The peristome is strongly curved upward posteriorly, not at all in front. About every fourth riblet of the outer surface is a trifle larger than the others, but the difference in size is not notable. Inside bluish-white. Fissure surrounded by a rather narrow callus rim; muscle-impression not deeply impressed except posteriorly. Fissure oblong-wedge-shaped, rounded at each end, its length a little over twice its greatest width, excavated on the back margin.

Length 20½, width 9, alt. 4½ mill.

Circular Head, Tasmania.

M. tasmanica TEN.-WOODS, Proc. Roy. Soc. Tasm. for 1875, p. 157, 1876 (not *M. tasmaniæ* Sowb.).—*M. weldii* T.-WOODS, P. R. S. Tasm. for 1876, p. 156, 1877; and *var. rosea radiata, l. c.*

First described as *M. tasmanica*, the name changed on account of the similarity to Sowerby's *M. tasmaniæ*.

Var. ROSEORADIATA Tenison-Woods.

Ornamented with numerous rose colored rays.

M. TASMANIÆ Sowerby Jr. Pl. 59, figs. 52, 53, 54.

Shell oblong, the length double the breadth or nearly so, elevated, the altitude one-fourth to one-third the length; lateral margins

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somewhat convex; radiately ribbed, ribs made irregular by irregular growth wrinkles; anterior ribs alternately large and small. Perforation wedge-shaped, its length contained about 4½ times in that of the shell. Color whitish, obscurely concentrically clouded with yellowish, and having riblets at intervals speckled with brown.

The peristome curves strongly upward posteriorly, and this end is more bluntly, broadly rounded than the other. The front end is not curved upward. The radiating riblets are much stronger on the long anterior slope, and alternate with much smaller ones; they are rendered uneven by irregular growth-marks. The orifice is on the posterior slope, which below it is broadly eroded, the erosion not extending, however, to the posterior edge of the shell. Inside it is white, except a tract on each side and in front of the fissure, which is pink. The fissure is double as long as its greatest width; it is surrounded by a callus, wide except on the back margin. Muscle-impression narrow, deeply impressed, especially posteriorly.

Length 27½, breadth 14, alt. 8–9 mill.

Tasmania.

M. Tasmaniæ SOWB. Thes., p. 206, f. 223.—*? M. Tasmaniæ* Gray, ANGAS, List of addit. sp. Marine Moll. S. Australia, in P. Z. S. 1878, p. 868.

M. MAXIMA A. Adams. Pl. 62, fig. 22.

Shell oblong, ornamented with little-elevated, subrugose riblets and obsolete concentric striæ; radiately maculated with brown. Back elevated, sides planulate, front extremity rounded; posteriorly elevated, subtruncate; foramen dilated, excavated posteriorly. (*Ad.*)

Hakodate, Japan.

M. maxima AD. P. Z. S. 1850, p. 202; H. & A. AD., Genera Rec. Moll. iii, t. 51, f. 5.—DUNKER Ind. Moll. Mar. Jap., p. 150.—*Fissurella macroschisma* Chemn., SCHRENCK, Reisen u. Forsch. im Amur-Lande, ii, Moll. des Amurlandes etc., p. 308.

The original description and figure are given. The name *macroschisma* has been applied to this species by some authors, but a glance at the figures in Chemnitz, and in Sowerby (*Genera, Conch. Ill.* and *Thesaurus*) show that at least two species have been confused under that name. Enquirers into the involved synonymy should consult Schrenck and Dunker (*l. c.*), but bear in mind that these authors have not properly discriminated between the two species mentioned above. It has not seemed expedient to give full references, at the risk of still more mistakes.

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1891, May 5.
Museum Comp. Zool.
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MANUAL

OF

CONCHOLOGY;

STRUCTURAL AND SYSTEMATIC.

WITH ILLUSTRATIONS OF THE SPECIES.

BY GEORGE W. TRYON, JR.

CONTINUATION BY

H. A. PILSBRY,

CONSERVATOR OF THE CONCHOLOGICAL SECTION OF THE ACADEMY OF NATURAL SCIENCES OF PHILADELPHIA.

Part 18 - Plain

PHILADELPHIA:

Published by Conchological Section,

ACADEMY OF NATURAL SCIENCES,

OF PHILADELPHIA.

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M. DILATATA A. Adams. Pl. 59, fig. 63.

Shell ovate-oblong, radiately costate, red variegated with white, rounded all around; sides dilated; foramen oblong, narrowed in the middle. (*Ad.*)

Habitat unknown.

M. dilatata AD. P. Z. S. 1850, p. 202.—SOWB. Thes. iii, p. 206, f. 220.

M. HIATULA Swainson. Pl. 59, figs. 30, 31.

Shell ovate-oblong, radiately costellate, brown, subdepressed, the sides concave, all over rounded; foramen large, oblong, posteriorly dilated; posterior extremity much elevated, margin scarcely sinuous. (*Ad.*)

Habitat unknown.

M. hiatula SWAINSON Malacol., p. 356.—AD. P. Z. S. 1850, p. 202.—*Fissurella macroschisma* SOWB. Genera of Shells, Fissurella fig. 5.

This species has the slit rather narrow, not much dilated posteriorly.

M. COMPRESSA A. Adams. Pl. 59, fig. 64.

Shell narrowly oblong, white radiately painted with rose, decussated by granulose riblets and concentric striæ, rounded, the back convex, sides compressed, inflexed in the middle; posterior extremity much elevated; foramen large, lanceolate, posteriorly dilated. (*Ad.*)

Suez.

M. compressa AD. P. Z. S. 1850, p. 202.—SOWB. Thes., p. 205, f. 218—FISCHER, Journ. de Conchyl. 1871, p. 210.

M. MEGATREMA A. Adams. Pl. 59, fig. 32.

Shell ovate-oblong, white, radiately painted with rose; sculptured with rugose riblets and concentric striæ; back subelevated, sides planulate; foramen ovate, lanceolate, very large. (*Ad.*)

Habitat unknown.

M. megatrema AD. P. Z. S. 1850.—SOWERBY, Thes., p. 205, f. 227.

M. CUSPIDATA A. Adams. Pl. 59, fig. 60.

Shell ovate-oblong, anteriorly narrowed, produced, acuminate; posteriorly elevated, rounded; margin deeply undulating; brown,

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ornamented with concentric brown rings, cancellated with elevated and concentric lines; pale around the foramen; posterior extremity much elevated; foramen large, cusp-shaped, dilated posteriorly.

Cagayan, Philippine Is.

M. cuspidata AD. P. Z. S. 1850, p. 202.—SOWB. Thes., p. 106, f. 226.

M. PRODUCTA A. Adams. Pl. 59, fig. 62.

Shell narrowly oblong, back elevated, convex, white, variegated with pale brown; obsoletely decussated with elevated lines and concentric striæ; anteriorly narrow, produced, sides planulate, posterior extremity rounded, elevated; margin deeply sinuated; foramen very long, triangular, posteriorly dilated. (*Ad.*)

Port Lincoln, S. Australia, deep water.

M. producta AD. P. Z. S. 1850, p. 202.—SOWB., Thes., p. 205, f. 224.—ANGAS, Moll. Fauna S. Austr., in P. Z. S. 1865, p. 185.

M. ANGUSTATA A. Adams. Pl. 59, figs. 61.

Shell narrow, oblong, back elevated, rounded, white, painted and tessellated with brown lines and reddish-brown spots; sculptured with obtuse, subrugose riblets and depressed, subdistant concentric lines; posterior extremity elevated, margin sinuated; foramen large, elongated, subtriangular, posteriorly dilated, excavated. (*Ad.*)

Habitat unknown.

M. angustata AD. P. Z. S. 1850, p. 203.—SOWB. Thes., p. 205, f. 225.

M. BAKIEI (A. Adams) Sowb. Pl. 59, fig. 65.

Shell oblong, subquadrate; anterior margin elevated, reflexed, sides anteriorly depressed; posterior margin depressed, subtruncate; having rounded, subnodulous ribs, alternately larger in front; white, ornamented with radiating bands varied with brown lines at the sides and between the ribs of the posterior portion. Foramen at the posterior margin. (*Sowb.*)

Habitat unknown.

M. Bakiei A. AD., (where?) SOWB. Thes. Conch., iii, p. 206, f. 221.

M. NOVÆCALEDONIÆ Sowerby Jr. Pl. 59, fig. 55.

Shell oval, grayish-red, minutely punctate, radiated with minute riblets larger posteriorly; anterior margin elevated, posterior margin subdepressed, scarcely acuminate; foramen rather short, situated

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at the anterior margin. A more regularly oval species than the preceding [*M. tasmaniæ*], and of a speckled reddish color. (*Sowb.*)

New Caledonia.

M. novæ-Caledoniæ SOWB. Thes. Conch., iii, p. 206, f. 222.

The absurdity of mistaking the head for the tail, in Sowerby's description, translated above, I will leave the reader to correct for himself.

M. SCUTIFORMIS Nevill. Pl. 6 *l*, fig. 20.

Shell ovate-elongate, laterally a little compressed and slightly insinuated; moderately elevated, a little solid, ornamented with radiating and minute concentric striæ; dull white, marked with a few radiating brown bands; foramen long, excentric, occupying nearly a third part of the entire length, narrowed behind; margin of the aperture a little obtuse, simple; margin of the foramen thickened within. Length 12¾, width 6½, alt. 2 mill. (*Nevill.*)

S. province Ceylon.

M. scutiformis G. & H. NEVILL, Journ. Asiat. Soc. Bengal, xxxviii, p. 163, t. 17, f. 14.

Genus LUCAPINELLA Pilsbry, 1890.

Lucapinella PILSBRY, Manual of Conchology, pt. 47, p. 179. Issued December 16, 1890.—*Clypidella* and *Fissurella*, in part, of authors.

Fissurellidæ with an oblong shell, not sunken in or covered by the mantle, and about as long as the foot; its apex subcentral, wholly removed by a rather large oblong perforation, which is margined within by an entire (not truncated) callus; edge of shell blunt, scarcely crenulated in adults except in front and behind; sculptured with scaly riblets; front and side-margins level, posterior margin a little elevated. Animal with a fleshy foot, much too large to be contained in the shell; mantle-edge thickened, papillose on its lower edge and having narrow processes extending up over the shell-edge; tentacles short, obtuse; foot surrounded by a row of epipodial papillæ; dorsal pore surrounded by papillar processes.

The genus defined above differs from *Fissurella s. s.* and *Clypidella* in the much larger, fleshier foot; from *Fissurellidea*, *Megatebennus*, *Pupillœa* and *Lucapina* in not having the shell at all imbedded in the mantle; and finally from *Macroschisma* by the subcentral fissure, short tentacles and possession of an epipodial row of

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papillæ. The basal margins of the shell are nearly level, not elevated at the ends as much as in *Megatebennus*, etc. The inside callus-rim of the perforation is not at all truncate posteriorly, as it is in *Glyphis*, and it further differs from that genus in having the summit rather behind than in front of the middle. The type is "*Clypidella*" *callomarginata* Cpr. of California.

Adam's figure of the animal of *Clypidella* (Gen. Rec. Moll., pl. 51, fig. 3) was probably drawn from a species of this genus, not from the true *Clypidella pustula*, which has been carefully examined by Dr. Paul Fischer, and found to be entirely different.

In an alcoholic specimen of *L. callomarginata* examined by me, the edge of the shell is scarcely covered by the mantle, but slender, rather distant processes extend up over it. The edge of the mantle is thick, finely granulose, its lower edge somewhat inflexed and papillose. Just under the mantle-edge, and concealed by it, is the row of epipodial papillæ, extending all the way around the foot. The foot itself is fleshy, higher behind, very minutely granulose, somewhat wrinkled, of an oval shape. The rostrum is short; the tentacles very short and stumpy, eyes on low inconspicuous swellings at their outer bases. Dorsal pore with papillose processes.

Fig. 4 of pl. 61, side view of animal in shell, double natural size.

Fig. 5 side view of head (the mantle turned upward), showing the short blunt tentacle and the beginning of the epipodial row of papillæ.

Fig. 2 fore part of foot and head, seen from beneath. The broad mantle is seen over the oral disk, and the tentacles on each side of it.

Fig. 3 enlarged view of the dorsal pore from above, the shell removed. The oval boundary-line corresponds to the outline of the internal callus around the hole in the shell.

✓ L. CALLOMARGINATA Carpenter. Pl. 44, figs. 3, 4, 5; pl. 61, figs. 1–5.

Shell oblong, a trifle narrower in front, rather depressed, the subcentral summit occupied by a rather large fissure, shaped like the shell and from one-fourth to one-fifth the shell's length. Surface having radiating riblets and concentric growth-laminæ, which are elevated into imbricating scales on the ribs; color gray or white, radiated with black.

The form is oblong, sides subparallel or somewhat convex. The front slope of the cone is a trifle convex, the lateral slopes straight

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or a little concave, the posterior slope concave. The two sides of the fissure project upward in more or less salient points. The sculpture consists of alternately larger and smaller radiating riblets, crossed by sharp, concentric laminæ, elevated into imbricating scales on the ribs. The blackish rays sometimes cover most of the surface, sometimes are narrow and few. Inside bluish-white, with a rather wide callus rim around the fissure; lateral edges blunt, ends slightly crenulated. In immature specimens the edges are crenulated. Length 19, breadth 10, alt. 4½ mill.

Lobitos and San Diego, Cal., to San Ignacio Lagoon, Lower Cal., in about 6 fms.

Clypidella callomarginata (Cpr.) DALL, Amer. Journ. Conch. 1872, p. 133, t. 15, f. 8.

The animal is described under the generic head. When standing on a plane surface the broad posterior extremity is seen to be a little elevated. The sculpture is very sharp and beautiful.

L. ÆQUALIS Sowerby. Pl. 31, fig. 24.

Shell oblong-ovate, rather thin, depressed, decussated with distant obtuse radiating and concentric striæ; orifice ovate, rather large; ashy-black, rayed with white. Unusually thin and depressed, with a rather large orifice. (*Reeve.*)

St. Elena, West Coast S. America.

Fissurella æqualis SOWERBY, P. Z. S. 1834, p. 127; Conchol. Illustr., f. 56.—REEVE, Conch. Icon. f. 55.—*Fissurellidea æqualis* SOWB., Thes. Conch. iii, p. 203, f. 200.

A species not seen by me, probably grouping with *callomarginata.*

L. ACULEATA Reeve. Pl. 36, fig. 19.

Shell oblong-ovate, slightly attenuated anteriorly, depressed, rather elevated in the middle, radiately finely ribbed, concentrically laminated, laminæ elegantly prickly-scaled; orifice ovate, large; fawn-white. The radiating ribs of this elegant species are almost wholly formed of elevated prickly scales. (*Rve.*)

Habitat unknown.

F. aculeata REEVE, Conch. Icon. f. 111, 1850.—SOWERBY, Thes. Conch. iii, p. 201, f. 186.

This and the next species may possibly prove identical; but the more anterior position of the orifice perhaps indicates *Glyphis* rather than *Lucapinella.* In the absence of information regarding the inside, the generic positions of many species are problematical.

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L. LIMATULA Reeve. Pl. 36, fig. 13; pl. 61, figs. 6, 7, 8, 9.

Shell small, oblong, narrower in front, rather depressed, the subcentral summit occupied by the oblong fissure, of the same shape as the shell, its length contained in that of the shell about 4½ times. Surface sculptured with alternately large and small radiating riblets in front, but at the sides and posteriorly, three small riblets occur between each pair of large ones, and of these three the middle one is largest; all this radiating striation is crossed by regular concentric laminæ, a little over a half millimeter apart, rising into erect semicircular scales wherever they intersect the radiating riblets. Color white, unicolored or rayed with ashen or blackish.

Inside white, showing the dark rays when they are present on the outside; callus rim of the perforation narrow. Muscle-impression not impressed; edges thickened at the sides, crenulated front and back.

Length 13, breadth 7½, alt. 4 mill.

Length 13, breadth 7½, alt. 2·8 mill.

Cape Fear; Key West, Fla.; St. Vincent and Barbadoes, West Indies.

Fissurella limatula REEVE, Conch. Icon. f. 115, Aug., 1850.—*Fissurellidea limatula Rve.* DALL, Rep. on 'Blake' Gastropoda, p. 409; Bull. U. S. Nat. Mus. no. 37, p. 170.

Very similar to the Californian *L. callomarginata*, but lighter colored and smaller. When adult the lateral margins of the shell are thickened, as in *callomarginata*.

* * *

Genus LUCAPINA Gray. (See p. 181).

Since the account of *Lucapina* was printed I have studied certain species which I had formerly referred to *Glyphis;* and have concluded that the following West Indian forms should be placed under *Lucapina* as a section having no especially distinct characters.

Section *Chlamydoglyphis* Pilsbry.

Shell thin, oblong, low-conical or depressed; orifice rather large, oval, situated in front of the middle; surface distinctly cancellated; internal hole-callus truncated behind; basal edges of the shell in one plane, not elevated at the ends; margin finely crenulated.

Animal in general characters much like that of *Megatebennus*, higher behind, depressed in front, the mantle covering about a

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third of the shell, falling over and enveloping the head and body, its edge simple, not papillose. There is a row of epipodial papillæ, about 20 on each side. Dentition unknown.

Comparisons should be made with the West Coast forms, the soft parts of which I have figured in Proc. Phila. Acad., 1891.

Species three: *elongata*, a small, narrow, parallel-sided form; *adspersa*, wider, larger; and *cancellata*, more conical, stained around the hole with black. Numerous shells of all lie before me.

L. ELONGATA Philippi. Pl. 62, figs. 1, 2: pl. 36, fig. 31.

Shell small, narrow, oblong, depressed; the side margins parallel, length twice the breadth (more or less). Front slope less than half as long as the posterior slope. Sculptured with alternately larger and smaller radiating riblets, with usually some short interstitial threads posteriorly. About 32 to 38 riblets may be counted around the perforation. These radiating riblets are crossed by elevated concentric threads, about 8 to 10 of which may be counted on each side of the perforation. Length of hole from one-sixth to one-seventh the length of shell.

Yellowish or white, irregularly freckled with brown. Inside whitish with radiating whiter lines, the hole-callus white, truncated posteriorly. Length 13, breadth 6½, alt. 2½ mill.

St. Thomas, West Indies.

F. elongata PHIL., Abbild. u. Beschreib., etc., ii, p. 33, Fissurella, t. 1, f. 2. (Oct., 1845).—REEVE, Conch. Icon. f. 110.—SOWERBY, Thes. p. 201, f. 185.—ARANGO, Fauna Mal. Cubana, p. 228.

Closely allied to the following, but narrower, the orifice more anterior, the rays interrupted into sparsely scattered dots and short lines. Arango seems in doubt about his identification. He records the species from Cuba and Guadalupe. The specimens before me are from St Thomas, collected by Robert Swift.

L. ADSPERSA Philippi. Pl. 62, figs. 6, 7; pl. 38, fig. 69.

Shell oblong, depressed-conical, the front slope more than half the length of the posterior slope; sculptured with radiating alternately larger and smaller riblets crossed by numerous concentric raised threads. Perforation oval, about one-seventh the length of shell.

White, brown-tinged or greenish-yellow, with 7–9 broad rays varying from flesh-colored to ashen or olive-brown. These rays are interrupted or broken into dots and spots in many specimens. In-

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side bluish-white, showing the dark marking of the outside through the thin shell. Hole-callus usually having a greenish streak on each side, truncated behind. Edge crenulated.

Florida specimens of the typical form measure:

Length 21, breadth 11½, alt. 4½ mill.

Length 21½ breadth 11½, alt. 5 mill.

Key West, Florida; St. Thomas and St. Croix, West Indies.

F. adspersa PHIL., Abbild. etc. ii, p. 34, t. 1, f. 3, (Oct., 1845).—*F. aegis* REEVE, Conch. Icon., f. 72, (June, 1850).—SOWB. Thes., p. 201, f. 188.—*Lucapina ? fasciata* (Pfr. Where?) DALL, Proc. U. S. Nat. Mus. 1883, p. 336.—*Fissurellidea fasciata* Pfr., DALL, Catal. Moll. S.-E. U. S., p. 172.

This species may be considered the type of *Chlamydoglyphis*. It differs from *elongata* Phil. in the larger size, more convex side margins and less excentric orifice; from *cancellata* in being lower, and not stained with blue-black around the orifice.

The external anatomy has been described by Dall (*l. c.*). From his description my knowledge of it is derived; unfortunately the form of the gills and the dentition is not yet known. The localities given are for specimens in the collection of the Academy.

In the typical *adspersa* the color-rays are much interrupted into dots and spots. In the form called *aegis* by Reeve (pl. 38, fig. 69) the rays are continuous. Intermediate specimens are to numerous to permit me to call *ægis* a variety. The largest specimen before me measures, length 30, breadth 17, alt. 5 mill.

F. lentiginosa Rve. (pl. 36, fig. 33) seems to be a synonym of the typical *adspersa*.

L. CANCELLATA Sowerby. Pl. 63, figs. 1, 2, 3; pl. 37, fig. 58.

Shell oblong-ovate, conical, *stained with bluish-black around the orifice and the internal hole-callus*. Sculptured with alternately larger and smaller radiating riblets, latticed by concentric raised threads. Orifice in front of the middle, oval, about one-eighth the length of the shell.

White or pale brown, unicolored or with pale brown rays, or flecked with brown dots. Inside white, hole-callus bluish-black, slightly truncated behind. Length 23, breadth 15, alt. 6½ mill.

Bahamas and Tortugas south to St. Thomas and St. Barts.

F. cancellata (Solander mss.) SOWERBY, Conch. Ill. f. 29.—REEVE, Conch. Icon. f. 51.—SOWB., Thes., p. 200 f. 189.—ARANGO, Fauna

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Mal. Cubana p. 228.—*F. hondurasensis* RVE., Conch. Icon. f. 70 (=*F. suffusa* Rve. *l. c.*, errata).—*Glyphis cancellata* Sowb., DALL, Catal. Mar. Moll. S. E. U. S., p. 170.

Sowerby's original figures look more like *F. adspersa* than like the species universally known as *cancellata*. The *cancellata* of all authors is the shell described above, characterized by a large oval orifice, a black hole-callus and blackish-blue around the hole outside. *F. hondurasensis=suffusa* is an absolute synonym, said to be from Honduras, the only mainland locality reported.

Subfamily III. EMARGINULINÆ (Gill) Pilsbry.

This subfamily is probably equivalent to Dr. Gill's family *Emarginulidæ* (Arrangement of the Families of Mollusks, 1871, p. 13); but I do not know whether Gill would have included *Glyphis* in his family, or restricted it to forms imperforate at the apex.

All *Fissurellidæ* having the apex persistent in the adult belong in this subfamily, and also those having the apex removed by the hole or fissure, behind which, inside, there is a septum or deck, or a posteriorly truncated hole-callus.

The *Emarginulinæ* as a whole differ from *Fissurellinæ* in having the rhachidian tooth of the radula broad; the radula bilaterally asymmetrical; the hole-callus, (in forms having a perforation) truncated behind. From *Fissurellidinæ* this subfamily differs in having the hole small, when present, the hole-callus truncated behind, the shell wholly external and capable of containing the entire animal.

Emarginulinæ includes the more primitive types of the Fissurellid stock both from the morphological and the palæontological standpoint.

Beginning with a few doubtful forms in the Carboniferous, the family attains a considerable number of species in the early Tertiary; but as far as I have seen, no described species older than Pliocene is to be referred to *Fissurellinæ* or *Fissurellidinæ;* they are all *Emarginulinæ*, of the genera *Emarginula* (+*Rimula* and *Deslongchampsia*), *Puncturella* (and its subgenera *Fissurisepta, Rostrisepta* etc.), and *Glyphis*.

The presence of a verge in Cranopsis, Puncturella, etc., and its absence in the more modern and differentiated groups, such as *Fissurella*, indicates that that organ is a common inheritance of the primitive Rhipidoglossate stock, now lost in the various divergent

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branches. The genera of *Emarginulinæ* exhibit nearly every stage from a Patella-like shell to the centrally perforated type. The more simple and primitive forms are *Scutus* and *Subemarginula;* then follow *Emarginula*, *Rimula*, *Puncturella*, and finally *Glyphis*, the most modified form.

The generic groups of this subfamily are moderately well-defined, and our ideas respecting their affinities and systematic importance will probably stand the test of time in essentially their present form. The following analysis of genera is based on shell-characters for the convenience of conchologists; but it should be remembered that a study of the soft parts of most of the genera has fortified the positions taken.

Key to Genera and Subgenera of Emarginulinæ.

I. Apex in front of the middle, absorbed by the hole, the latter bounded inside by a distinct oval hole-callus, truncated behind. Genus GLYPHIS Cpr.

II. Apex central or post-median, persistent or absorbed; anal fissure either a closed hole or a slit open in front; no distinct hole-callus, but having a septum or "deck" extending forward from back of the fissure, inside.

A. Anal fissure a closed hole at summit or on the front slope, Genus PUNCTURELLA Lowe.

a. Apex persistent, the fissure in front of it.

1. Fissure at the summit, Section *Puncturella s. s.*
2. Fissure on the front slope, Section *Cranopsis* Ad.

b. Apex absorbed by the oval fissure; surface without radiating riblets, Section *Fissurisepta* Seg.

B. An open fissure in the front margin, Genus ZEIDORA Ad.

III. No internal hole-callus or septum; apex not absorbed.

A. A slit-fasciole or band in front, distinctly differentiated from the other radiating riblets, extending upward from the fissure, Genus EMARGINULA Lam.

a. Fissure an open anterior slit, Subgenus *Emarginula s. s.*

b. Fissure a closed hole on the front slope, Subgenus *Rimula* Defr.

B. No distinctly differentiated slit-fasciole or band; ends of muscle-scar distinctly hooked inward; shell having radiating ribs or riblets and crenulated edge, slit short or none Genus SUBEMARGINULA Blainv.

C. No anterior slit or slit-fasciole; muscle scar near the edge

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of the shell, its front ends not hooked inward; shell depressed, oblong, truncated or sinuous in front; surface lacking distinct radiating sculpture; edge smooth

Genus SCUTUS Montf.

Genus GLYPHIS Carpenter, 1856.

Glyphis CPR. P. Z. S. 1856, p. 223, footnote. Type *F. aspera* Esch.; Catal. Mazat. Sh., p. 220.—*Lucapina*, in part, H. & A. ADAMS Genera Rec. Moll.

Few words are sufficient to distinguish this genus from all Fissurellinæ and Fissurellidinæ: *Rhachidian tooth of the radula wide; internal hole-callus of the shell truncated behind.*

Shell ovate, conical, the orifice in front of the middle. The apex spiral, inclined backward in the young, wholly absorbed in the adult. Surface cancellated by radiating and concentric riblets or striæ. Internal hole-callus truncated behind or having a pit there. Basal edges of the shell in a plane or the sides slightly elevated; ends never elevated; margin crenulated.

Animal capable of being entirely contained in the shell, resembling *Fissurella* in external characters. Snout short, ending distally in an oval disc with the mouth in the center; tentacles subulate with black eyes on little projections at their outer bases; epipodium consisting of a fringe of short filamentous processes alternately larger and smaller, becoming more obsolete posteriorly where it is marked by little tubercles in place of the filaments. Mantle-edge smooth or papillose, usually rather broad. Central tooth of the radula wide.

This genus has been confused by all authors (except Carpenter) with *Fissurella*. It certainly belongs to a distinct subfamily, being more intimately related to *Emarginula* and its allies.

The young *Glyphis* (3–4 mill. in length) has a recurved spiral apex with the fissure in front of it, exactly as in *Rimula*. The truncation and pit back of the hole-callus are homologous with the septum and pit back of the hole in *Puncturella*; a fact not heretofore noticed. *Glyphis* may be considered the highest or most modified form of the subfamily *Emarginulinæ*, and *Scutus* the lowest or most archaic.

It is doubtful whether the fossil group *Atractotrema* of Cossman (Mém. Soc. Roy. Malac. de Belgique, xxiii, p. 31) should be referred to *Glyphis* or to *Rimula*.

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Group of G. calyculata Sowb.

Shell having several of the posterior radiating ribs much more prominent than the others.

G. calyculata has almost as distinct a septum and pit behind the hole as some species of *Puncturella*.

G. CALYCULATA Sowerby. Pl. 36, figs. 17, 18.

Shell ovate, angular behind, elevated, conical; front slope concave, posterior slope convex. There are three or four very prominent ribs radiating backward from the vertex, the intervals between them each bearing three riblets; sides and front of the shell having numerous subequal riblets; the whole latticed by numerous concentric laminæ, about a half mill. apart, cutting the interstices into pits and forming low scales on the radiating riblets.

The color is pink, with dots, and radiating and concentric lines of red. Inside pinkish-white; there is a very deep pit just behind the nearly round hole. Length 16, width 10½, alt. 7 mill.

Natal, near Cape L'Agulhas.

F. calyculata SOWB., Genera of Shells, Cephala, Fissurella, f. 4; Illustr. Conch. f. 19.—REEVE, Conch. Icon. f. 88, 109.—SOWB. 2D., Thes. p. 193, f. 126, 127.—KRAUSS, Die Südaf. Moll. p. 68.

May be known by the three strong, imbricated posterior ribs and the very deep pit behind the hole-callus. The coloration is more or less rosy.

G. SIEBOLDII Reeve. Pl. 38, figs. 58, 59.

Shell ovate, angular behind, elevated, conical; slopes nearly straight; hole in front of the middle, its posterior margin elevated. Sculpture consisting of about 11 strong radiating ribs, of which those at the back and sides are strongest, bearing three riblets in each interval; in front the ribs alternate with smaller ones. The whole latticed by elevated, separated concentric laminæ, forming scales on the ribs; between these laminæ there may be seen fine concentric threads or striæ, two or three in each interval between the lamellæ.

The color is whitish, variegated with ashen or dotted on the ribs with pale flesh-color; orifice small, shortly oblong; hole-callus narrow, truncated behind; margin serrated. Length 17, breadth 11, alt. 7 mill.

Singapore to Japan.

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F. sieboldii RVE., Conch. Icon., f. 102, 1850.—DUNKER, Ind. Moll. Mar. Jap., t. 6, f. 14, 15.—SOWERBY, Thes., p. 193, f. 138.

F. octagona, nigro-ocellata of Rve. and *F. varicosa* Sowb. are probably forms of this species. The original descriptions and figures are given below.

F. octagona Rve. (pl. 39, fig. 97). Shell ovate, rather elevated, 8-ribbed, with small minutely granulated ridges in the interstices; orifice ovate, rather broad, inclined anteriorly; whitish with broad light-brown rays near the margin, bluish around the orifice. Length 6 mill. Ticao, Philippines. (*Conch. Icon., f.* 116.)

F. nigroöcellata Rve. (pl. 39, fig. 98). Shell ovate, rather elevated, strongly radiately and concentrically ribbed, ribs rather distant, interstices thickly latticed; orifice orbicular; white painted with a row of black spots near the margin. Length 5½ mill. Ticao, Philippines, in 6 fms. (*Conch. Icon., f.* 117.)

Both of these are evidently young shells.

F. varicosa Sowb. 2d. (pl. 63, figs. 6, 7.). Oblong, conical, apex elevated, with three large radiating strongly nodulose ribs behind, six large ones in front with smaller riblets in the interstices; cancellated by elevated, distant concentric lines. Internal callus scarcely septiform; orifice small, round, situated at and inclined toward the front. It is not internally chambered as in *F. calyculata.* The three posterior prominent ribs are very coarsely knobbed. China Seas. (*Thes. Conch. iii, p.* 193, *f.* 52, 53.)

Group of F. græca Linn.

Coarsely latticed by radiating ribs and concentric cords.

G. GRÆCA (L.) Auct. Pl. 35, figs. 7, 8, 9, 10.

Shell oval, usually a little narrower in front, depressed or elevated; lateral slopes nearly straight, front slope straight or subconcave, posterior slope a little convex, sculpture consisting of strong, elevated radiating ribs, alternately larger and smaller, usually with minute riblets in some of the interstices, latticed by elevated concentric liræ, rendering the ribs nodose at their intersections, and cutting the interstices into square pits.

The color is whitish-yellow or brown, unicolored or rayed with darker brown. The inside is white, margin strongly denticulate, toothlets generally in pairs. Length 26, breadth 18, alt. 8–11 mill.

Mediterranean and Adriatic Seas; Atlantic, from Southern English coast to Gibraltar.

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Patella græca LINN., Syst. Nat. xii, p. 1262 (doubtful).—*Fissurella græca* DESH., SCACCHI, PHILIPPI, LAMARCK, DUNKER, JEFFREYS, WEINKAUFF, BUQ., DAUTZ. & DOLLF. and others.—*Patella reticulata* DONOVAN, Brit. Sh. i, t. 21, f. 3.—*Fissurella reticulata* FORBES & HANLEY, Brit. Moll. ii, p. 469, t. 63, f. 4, 5, and of some others.—*F. mamillata* RISSO, Eur. Mérid. iv, p. 257, t. 10, f. 145.—*F. dominicana* O. G. COSTA, Catal. Taranto, p. 43, t. 4, f. 2.—*F. corrugata* COSTA, *l. c.* p. 44, f. 3.—*F. recurvata* COSTA, *l. c.* p. 44.—*F. occitanica* RECL., Rev. Zool. Cuv., p. 111.—*Cemoria montaguana* LEACH, Syn. Moll. Gt. Br. p. 213, t. 10, f. 6.

An excessively variable species. The surface in the more typical forms is cut into square pits by the strong riblets and concentric liræ. There is much doubt as to whether this is really the *Patella græca* of Linnæus, but the use of that name by the great majority of authors has fixed it too firmly to be changed; especially since the name *reticulata* Don. is preoccupied by Linnæus.

It is smaller than the West Indian *G. listeri*, and the fissure is more anterior.

The named mutations are as follows: (1) *conica* Réq., summit much elevated; (2) *gibba* Jeffr. (not Phil.!), form elevated, the apex more anterior than in the type, base strongly arched; (3) *depressa* Monts., depressed, the reticulation obsolete; (4) *ima* Greg., still more depressed. Palermo; (5) *mucronata* Monts., large and coarsely latticed; (6) *minor* Marion.

G. LISTERI Orbigny. Pl. 37, figs. 37, 38, 39; pl. 62, fig. above 31, 32.

Shell ovate, conical, elevated, summit a little in front of the middle; front slope straight, back slope somewhat convex. Sculpture consisting of numerous strong radiating ribs crossed by elevated concentric cords which render the ribs nodose at their intersections and cut the interstices into square pits.

The shell is solid, grayish-white or buff, unicolored or having radiating black stripes. The radiating ribs are usually alternately large and small; the concentric cords are equally spaced and prominent. The perforation is key-hole shaped, encircled at the edge by a blackish line. Inside white, the hole-callus either white or bounded by a blue-black line. Border crenulated, the denticulations in pairs. Length 40–42, breadth 29–30, alt. 15–17 mill. Specimens of ordinary size measure 25–30 mill. in length.

Florida Keys to Nicaragua and Barbados; West Indies generally.

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F. listeri ORB., Moll. Cuba, ii, p. 197, t. 24, f. 37–39.—ARANGO Faun. Mal. Cubana, p. 228.—REEVE, Conch. Icon., f. 71.—SOWB. Thes., p. 194. f. 130, 131.—DALL, Mar. Moll. S.-E. U. S., p. 170.

Nearly related to *G. græca* of the Mediterranean, but attaining much larger size, the latticed sculpture generally coarser, the apex more central, bounded by a black line, as it usually is in the *græca*. The two forms are very closely allied, separated more on account of their different distribution than for any other reason. *F. nigro-ocellata* Rve. should be compared with the young of this species. See under *G. sieboldii* Rve.

G. FONTAINIANA Orbigny. Pl. 62, figs. 28, 29, 30.

Shell ovate-oblong, subconic, narrower in front, white, longitudinally and transversely ribbed, decussated, the ribs acute, unequal; fissure subrotund, large. Length 20, alt. 8 mill. This charming species approaches the *F. græca*, but it is more elevated, more conic, the hole rounder, wide and horizontal; the ribs are more elevated and salient, spinose; the internal hole-callus is narrow and equal all around, not truncated behind. (*Orb.*)

Islay, Peru, in 30 meters depth.

F. fontainiana ORB., Voy. dans l'Amér. Mérid., p. 477, t. 78, f. 12–14.

G. FOVEOLATA Garrett. Pl. 63, figs. 17, 18, 19.

Shell oval, conical, hole a little in front of the middle, slopes straight or convex posteriorly. Surface having about 18 strong radiating ribs (with some smaller interstitial riblets usually) crossed by raised concentric threads, which bead the ribs and cut the interstices into deep squarish pits.

White or brownish, with irregularly scattered spots of black or deep brown, the spots showing through the thin shell on the inside. Hole-callus truncated behind. Length 8½, width 6, alt. 3¼ mill.

Viti Islands.

Very coarsely sculptured, like a small *G. græca* or *G. listeri*. The hole-callus is dark. The largest specimen was unfortunately broken, so that the figures and measurements are from a smaller one. I do not know where it was originally described. The specimens are from Garrett.

G. GRANIFERA Pease. Pl. 63, fig. 13.

Shell small, oval, conical, elevated, the apex a little in front of the middle; slopes straight or nearly so; sculptured with subequal

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radiating beaded riblets, about 28 in number, latticed by concentric liræ.

White with 8 or 9 green rays; orifice small, oblong. Interior showing the rays. Hole-callus distinctly truncated posteriorly. Length 5½, breadth 4, alt. 2½ mill.

Sandwich Is.

F. granifera PSE., P. Z. S. 1861, p. 244.—*Glyphis granifera* CARPENTER, P. Z. S. 1865, p. 516.

The small size, short-oval, conical form and light green rays (rarely absent) distinguish this form. The specimen figured is from Pease.

G. SIMILIS Sowerby.

The ribs are thinner and the shell more elevated and conical than *F. listeri;* these with the Australian habitat may justify the distinction. (*Sowb.*)

Australia.

F. similis G. B. SOWERBY 2D., Thes. iii, p. 194, f. 143.

The original description is given above.

G. SALEBROSA Reeve. Pl. 39, fig. 7.

Shell somewhat orbicularly ovate, depressed, radiately rudely ribbed, ribs nearly equal, conspicuously fimbriately squamate throughout, with concentric laminæ; orifice rounded; whitish, here and there stained and linearly marked with brown. (*Rve.*)

Kurrachee, Mouth of the Indus.

F. salebrosa RVE., Conch. Icon., f. 78, 1850.

G. JUKESII Reeve. Pl. 38, fig. 60; pl. 39, fig. 61.

Shell oval, conical, the slopes straight, orifice a little in front of the middle. Sculptured with 19–23 strong radiating ribs, separated by very deeply cut interstices which generally bear an intermediate riblet; latticed by elevated concentric lamellæ forming recurved scales on the riblets, and cutting the interstices into deep pits.

The color is whitish, nearly unicolored or spotted with blackish-brown. Interior white, the hole-callus bounded by a dark line, abruptly truncated behind. Orifice small, oval.

Port Lincoln, Port Adelaide Creek, S. Australia; Port Molle, N. E. coast of Australia.

F. jukesii RVE., Conch. Icon. f. 45, 1849.—SOWB., Thes., p. 193, f. 147, 148.—*Glyphis jukesii* ANGAS, P. Z. S. 1865, p. 184.—*F. fimbriata* RVE., *l. c.* f. 104, 1850.

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A beautifully sculptured form; the interstices are very deeply carved, the concentric lamellæ are elaborately frilled.

G. CYATHULUM Reeve. Pl. 39, fig. 95; pl. 61, figs. 16, 17.

Shell ovately conical, elevated, radiately sharply squamately ribbed, ribs alternately larger, latticed with narrow concentric ridges; orifice small, ovate; whitish, variegated with brown. Somewhat like *F. excelsa* but not so elevated, more coarsely latticed, and differently perforated. (*Rve.*)

Habitat unknown.

F. cyathulum RVE., Conch. Icon., f. 114.—SOWB. Thes., p. 194, f. 152, 153.

G. EXCELSA Adams & Reeve. Pl. 64, fig. 33.

Shell elevated-conical, with large unequal subsquamate rudely clathrate ribs; margin crenulated, orifice small, subrotund, inclining posteriorly; whitish or greenish. (*Ads. & Rve.*)

China Sea.

F. excelsa ADS. & RVE. Zool. Samarang, Moll., p. 70, t. 11, f. 5.—? Not *F. excelsa* Rve., Conch. Icon.

G. ALTA C. B. Adams. Pl. 63, figs. 23, 24.

Shell subconic, high, dingy white, often more or less covered with broad ashy black rays, which may be seen through the shell, with prominent radiating ribs, of which the alternate ones are excessively developed, and intermediate small raised lines; with many concentric ridges, which are less prominent than the larger radiating ribs, and more so than the others; summit nearer to and somewhat inclined towards the anterior extremity; fissure small, ovate elliptic; margin pectinated by the radiating ribs.

The following are the dimensions of a very large and high shell and of another of average size:

Height ·42 inch.; length ·55 inch.; breadth ·41 inch.

Height ·22 inch.; length ·42 inch.; breadth ·29 inch. (*Ad.*)

Panama; Mazatlan.

F. alta C. B. AD. Catal. Panama Sh., pp. 236, 320.—*Glyphis alta* CARPENTER, Mazatlan Catal., p. 221.—*? F. excelsa* REEVE, Conch. Icon., f. 113, 1850, not of Adams and Reeve.

Reeve described under the name *F. excelsa*, in the Conchologia Iconica, a shell which seems to be identical with C. B. Adams' *alta*. It is not the *excelsa* of Adams and Reeve, described in the Zoology of the Samarang. The description is as follows:

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F. excelsa Reeve (pl. 39, fig. 96). Shell elevately conical, inclined anteriorly, finely latticed with radiating and concentric ribs which are elegantly squamate; orifice small, sides prettily excavated in the middle; brownish-white, spotted here and there with pinkish-brown. (*Rve.*)

Eastern Seas.

G. FLUVIANA Dall. Pl. 27, figs. 52, 53.

Shell low, conical, reticulated, white or translucent, variegated with gray or olive-green lines or dots mostly radiately disposed; form variable with station, but usually in the young and in more normal adults both slopes of the cone are a little concave near the apex. The anterior slope slightly convex; the posterior slope straight or a little concave, and usually a little longer than the other, though these characters vary with station. Base is rounded-oval, symmetrical and equal at both ends, with a thin simple margin. Sculpture of slightly irregular sudden enlargements of the shell, giving the effect of very narrow steps, over which some twenty moderately strong, and as many more faint, flattened radii seem to flow. In other specimens these step-like ridges are produced into low laminæ, and the ribs are also stronger and at the intersections nodulous, or even a little scaly. Apex erect, truncate by the pore, which is circular, simple, and within margined by a narrow horse-shoe-shaped callus. Exterior dull or unpolished, interior shining, with the color rays and ribs visible through the thin shell. Two specimens measure, alt. 4·0 and 6·0, lon. 10·0 and 9·5, lat. 6·6 and 6·5 mill., respectively. (*Dall.*)

Florida Straits to Barbados, 76–100 fms.

G. fluviana DALL, Blake Gastrop., p. 408, t. 14, f. 6, 6a. Closely allied to *G. alta* C. B. Ad.

Group of G. italica Defr.

Surface rather finely latticed; the radiating riblets generally alternating or unequal in size.

G. ITALICA Defrance. Pl. 36, figs. 14, 15, 16.

Shell ovate, narrower in front, rather depressed; lateral slopes convex below, becoming concave or straight above; sculpture consisting of closely crowded, rounded radiating riblets, and very fine, close concentric growth striæ. There are about 20 equidistant rib-

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lets of somewhat larger size, having three smaller intermediate riblets in each interval.

The shell is solid, strong. Color whitish or grayish yellow, unicolored or having ill-defined darker rays or occasionally a concentric band. Inside white, often with a concentric bluish zone; border finely denticulate, the toothlets usually in pairs; basal margin more or less arched, the ends alone supporting the shell. Length 57, breadth 40, alt. 20 mill.; often smaller, L. 44, br. 29, alt. 16.

Mediterranean and Adriatic Seas; Cape Verde Is.

F. Italica DEFR., Dict. Sc. Nat. xvii, p. 79, 1820.—BUQ., DAUTZ. & DOLLF., Moll. Mar. Rouss. p. 476, t. 53, f. 1–3.—*F. costaria* DESH., Coq. Foss. Env. Paris, t. 2, f. 10–12, 1824.—PHIL., Enum. Moll. Sicil. i, p. 116, and of others.—*F. defrancia* RISSO, Eur. Mérid. iv, p. 258.—*F. neglecta* DESH., Encyc. Méth. ii, p. 138, 1830, and of authors generally.—*F. mediterranea* GRAY in SOWB. Conch. Illustr. f. 30.—*F. crassa* and *F. tectumpersicum* O. G. COSTA, teste MONTEROSATO.

This form, usually known as *F. neglecta* Desh., is larger than other Mediterranean Fissurellidæ. It differs moreover in the close rounded riblets, decussated by very fine concentric striæ. It is widely distributed as a fossil (Miocene to Quaternary) in Europe.

The mutations noted by Buquoy, Dautzenberg and Dollfus are as follows: (1) *conica* Monts. (=*elevata* Monts. *olim*); (2) *major* Fischer; (3) *minor* Monts.; (4) *depressa* Monts., very much flattened; (5) *latereplicata* Monts., an exaggerated form of the preceding, the lateral borders being upturned.

G. ALTERNATA Say. Pl. 37, figs. 50, 51, 52, 53; pl. 61, figs. 24, 25.

Shell oval, elevated, conical, front slope straight or concave, back slope convex; surface closely, finely latticed by radiating riblets (every fourth one slightly larger) and concentric elevated lirulæ or laminæ, which form little scales where they cross the radiating riblets.

Color grayish-yellow or buff, unicolored or radiately striped with pink, *black* or brown; the stripes are eight in number, often broken into angular spots; sometimes unicolored blackish specimens occur. Summit in front of the middle, more or less curved forward. Fissure key-hole-shaped, not encircled by a dark line. Inside white;

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margin finely crenulated; pit back of the hole-callus deeply excavated.

Length 36, breadth 22, alt. 16 mill. (Largest specimen seen.)

Length 28, breadth 18, alt. 12 mill. (Average West Indian specimen).

Chesapeake Bay to Trinidad, including the entire West Indies; Bermuda (Heilprin); *Vera Cruz and Progreso* (Baker); *Nicaragua*.

Fissurella alternata SAY, Journ. Acad. Nat. Sci. Phila. ii, p, 281, June, 1822.—BINNEY'S edition of Say's Complete Writings, p. 73.—DALL, Blake Gastrop. p. 407, with var. *Sayi;* and Catal. Mar. Moll. S–E. U. S., in Bull. 37, U. S. Nat. Mus., p. 170.—*Glyphis alternata Say*, BAKER, Proc. Acad. Nat. Sci. Phil. 1891, p. 55.—*Fissurella fumata* RVE., Conch Icon. f. 63.—*F. Dysoni* RVE., *l. c.* f. 86.—*F. larva* RVE, *l. c.* f. 98.—*F. metcalfii* RVE., *l. c.* f. 75.—SOWERBY, Thes. iii, p. 192, f. 140–142.—*F. viminea* RVE., *l. c.* f. 105.—*F. cayenensis* LAM., An. s. Vert. vi, pt. 2, p. 12.—DELESSERT, Rec. de Coq. t. 24, f. 5.—REEVE, Conch. Icon. f. 82.—SOWB., Thes., p. 197, f. 101.

This is a very finely, sharply sculptured form, much more finely clathrate than *G. listeri,* and having the concentric threads raised into minute scales on the ribs. I have seen no living specimens from north of Chesapeake Bay, but dead shells are occasionally washed up on the beach at Cape May, N. J. Dr. Sharp collected the species at Trinidad. The more prominent riblets number from 18–24.

F. larva Rve. (pl. 37, fig. 57) is a dark form; *F. dysoni* Rve. (pl. 37, fig. 54) is the common black-banded variety; *F. metcalfii* Rve. (pl. 39, f. 91), and *F. viminea* Rve. (pl. 39, f. 80) do not seem to be distinct. The figures of *F. cayenensis* Lam. given by Delessert, Reeve and Sowerby, as well as Lamarck's description, indicate that that supposed species also belongs here. *Cayenensis* is rather an elongated shell, more straight-sided than the usual *alternata.* Specimens before me, from St. Thomas and other places, agree with the Lamarckian type. Reeve's figure of *cayenensis* is given on pl. 37, fig. above 60.

Var. *fumata* Reeve (pl. 39, fig. 1). Whitish, rayed with olive-ash; bluish around the orifice. This form is before me from Trinidad. It is less sharply sculptured than the type.

Var. *Sayi* Dall. Smaller, olivaceous, color-rays faint or absent. This is the deep water form.

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G. TANNERI Verrill. Pl. 63, figs. 25, 26.

Shell large, ovate, rather thin, with regularly and finely decussated sculpture. Apex nearer the anterior (smaller) end, moderately elevated. Perforation not large, round-ovate, conformable with the outline of the shell but more rounded, whole surface covered with rather fine, raised, radiating lines, with interstices of similar width or narrower; these are decussated by numerous concentric raised lines, which rise into nodules, or towards the margin form small, arched lamellæ in crossing the radii. Shell, externally, pale yellowish-gray, internally lustrous bluish-white; edge finely crenulated. Length 46, breadth 31, height 16 mill.; longest diameter of apical foramen 4, its breadth 3 mill. (*Verrill.*)

Off Delaware Bay to Hatteras, in 104–142 fms.

F. tanneri V., Proc. U. S. Nat. Mus. v, p. 333, 1882; Trans. Conn. Acad. Sci. vi, p. 255, t. 29, f. 13, 13a.—*Glyphis tanneri* DALL, Cat. Mar. Moll. S.-E. U. S. p. 170.

Closely allied to the Maryland Miocene fossil *F. redimicula* Say, (Journ. A. N. S. Phil. iv, p. 132, t. 8, f. 1.), but longer, narrower, less elevated, the orifice less central. It is also allied to *F. alternata* Say.

G. PATAGONICA Orbigny. Pl. 61, figs. 21, 22, 23.

Shell ovate, narrowed in front, conical; the summit in front of the middle; front slope straight, about half the length of the slightly convex posterior slope; sculpture consisting of close fine subequal radiating riblets, decussated by fine concentric raised threads.

The color is white, or broadly greenish rayed; inside white; hole-callus very distinctly truncated posteriorly. Orifice large, wide. Length 38, alt. 14 mill. Length 25, alt. 9 mill.

Rio Janeiro to Patagonia.

F. patagonica ORB., Voy. dans l'Amér. Mérid. p. 476, t. 64, f. 1–3.

Decidedly more finely latticed than *F. listeri*, more like the Mediterranean *G. italica*. The fissure is larger than usual in *Glyphis*, and is situated at the anterior third of the length.

G. SUBROSTRATA (Gray) Sowb. Pl. 61, fig. 18.

Shell oval, somewhat depressed, anteriorly subrostrated, extremities raised; white within, with a crenated border; externally radi-

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ately ribbed, ribs rather distant, muricated; dorsal aperture small, elliptical, its internal edge broad. Length 1·1, breadth 0·8 inches. (*Sowb.*)

St. Vincent.

F. subrostrata GRAY in SOWB., Conchol. Illustr. p. 6, f. 35.—*? F. subrostrata* "Guild.," SOWB. 2D, Thes., p. 192.

The original description and figure are given.

✓G. ASPERA Eschscholtz. Pl. 36, figs. 28, 29, 30.

Shell ovate, narrower in front, conical, the slopes nearly straight or a little convex behind the middle. Sculptured with numerous radiating riblets, of which 30–34 are larger, the intervals between them bearing about three smaller ones; the whole decussated by close elevated concentric liræ, which are more or less scale-like and imbricating.

Color soiled whitish, with numerous wide blackish rays. Inside white, hole-callus white, very abruptly truncated behind; margin deeply and sharply crenulated. Perforation short-oval, nearly circular, in front of the middle. Length 56, width 40, alt. 18 mill.

Sitka to Monterey Bay, Cal.

Fissurella aspera ESCHSCHOLTZ, Zool. Atlas, pt. 5 (edit. Rathke), 1833, p. 21, t. 23, f. 5.—*Glyphis aspera* of American authors.—*F. lincolni* (Gray) in SOWB., Conchol. Illustr. p. 7, f. 14.—REEVE, Conch. Icon. f. 62.—SOWB., Thes., p. 198, f. 133.—*F. cratitia* GOULD, Proc. Bost. Soc. N. H, ii, p. 155, 1846; U. S. Expl. Exped. Sh. p. 367, f. 471.—*F. aspera* SOWB., P. Z. S. 1834, p. 127; Conch. Illustr. f. 46.—REEVE, Conch. Icon. f. 30.—SOWB. 2D, Thes., p. 198, f. 125.

This is the largest of the West Coast species, in fact the largest of the genus, although occasional specimens of *G. italica* attain almost the same size. *G. italica* has a much larger key-hole-shaped perforation. The original figures of Gould's *F. cratitia* are given on pl. 42, figs. 60, 61. It is a broken, worn specimen.

A more doubtful synonym is F. ASPERA Sowerby. The figure of it is given on pl. 30, fig. 6. The original description is as follows: "Shell oval, rather high, sharply sculptured, longer behind; ashen inside, the margin white, crenulated; outside with numerous radiating riblets, muricately decussated; dorsal aperture circular, situated in front of the elevated vertex. Habitat, Pacosmayo, Peru." If this prove a good species the name must be changed.

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G. DENSICLATHRATA Reeve. Pl. 39, fig. 86.

Shell oval-oblong, elevated, perforation at about the front third of the length, front slope straight, posterior slope convex; sculptured with very numerous narrow subequal riblets, beaded at their intersections with the fine concentric elevated striæ. Hole small, oval.

The beads on the riblets are rounded, but irregularly developed on different shells. The interior is white, hole-callus white, slightly truncated behind, sometimes encircled by a brownish rim. Edge finely crenulated; basal side-margins scarcely arched, nearly level; posterior end of the short-oval hole scarcely more elevated than the front end. The surface is lusterless, dull grayish with blackish stripes. Length 16½, width 10, alt. 7 mill.

Santa Barbara, San Diego, etc., California.

F. densiclathrata RVE., Conch. Icon. f. 64, 1850.

G. INÆQUALIS Sowerby. Pl. 34, fig. 63.

Shell oblong, narrower in front, rather depressed, the front slope about half the length of the posterior slope; sculptured with close fine subequal radiating riblets, crossed by still closer elevated concentric threads. Perforation about three times as long as wide, about one-seventh the length of the shell.

Inside white or having dark rays, rings or patches, the hole-callus wide, very distinctly truncated behind. *Riblets of the outer surface visible as white radiating lines within.* Side-margins arched, so that the shell rests upon the ends alone. Color yellowish or grayish, rayed with dull black. Length 27, width 16, alt. 7–8 mill.

San Ignacio Lagoon, Lower California; Mazatlan.

F. inæqualis SOWB., P. Z. S. 1834, p. 126; Conch. Illustr. f. 45.—REEVE, Conch. Icon. f. 50.—*F. pica* SOWB., P. Z. S. 1834, p. 126; Conch. Illustr. f. 32, 33.—RVE., Conch. Icon. f. 49.—*Glyphis inæqualis Sowb.*, CARPENTER, Mazat. Catal. p. 220.

The extreme forms of this species are very dissimilar. Typically it has the hole very near the front margin, and long, narrow, trilobed; other specimens have a rounder hole, much nearer the middle of the shell.

Var. PICA Sowb. Pl. 34, fig. 64.

Perforation short-oval, nearer the center.

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G. PANAMENSIS Sowerby. Pl. 32, fig. 35.

Shell rotundately oval, a little compressed at the sides, radiately thinly ribbed, the interstices being very finely cancellated; orifice small, rounded; white, blotched and lightning-marked with brown. (*Rve.*)

Panama, 6–10 fms., on dead shells.

F. panamensis SOWB., P. Z. S. 1834, p. 127; Conch. Illustr. f. 72.*—REEVE, Conch. Icon. f. 87.—SOWB., Thes., p. 196, f. 123.

G. CRENIFERA Sowerby. Pl. 37, fig. 55.

Shell oblong-ovate, depressed, radiately ribbed and striated, ribs muricately nodose, obsoletely squamosely decussated with concentric striæ, margin scarcely crenulated, orifice elongately oblong, sides excavated in the middle; broadly rayed with white and brown-red. (*Rve.*)

Real Llejo, Central America.

F. crenifera SOWB., P. Z. S. 1834, p. 128; Conch. Ill. f. 73.—REEVE, Conch. Icon. f. 83.

May belong to *Fissurella* rather than to *Glyphis*. It may be doubted whether the *crenifera* of Reeve is the same as that of Sowerby.

G. SQUAMOSA Hutton. *Unfigured.*

Solid, oblong, with strong, radiating, more or less squamose ribs; anal perforation small, apical; margin crenated. Brownish, interior white. Height ·25, length ·9, breadth ·6, anal perforation ·08 inch. (*H.*)

New Zealand.

F. squamosa HUTTON, Cat. Mar. Moll. N. Z. 1873, p. 42; Journ. de Conchyl. 1878, p. 35; Manual N. Z. Moll. 1880, p. 105.

G. RUBIGINOSA Hutton. *Unfigured.*

Conical, ovate, apex subanterior, thin, smooth, radiately ribbed; ribs 13–17; anal perforation apical, small, covered up from the inside. Outside white, interior pinkish. Height ·2, length ·6, breadth ·5 inch. (*H.*)

Chatham Is. only.

F. rubiginosa HUTTON, Cat. Mar. Moll. N. Z. p. 42, 1873.

From the description I would think this a *Puncturella*. Hutton ignores it in his later lists.

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G. TONGANA Quoy & Gaimard. Pl. 59, figs. 38, 39.

Shell ovate-oblong, convex, white; vertex a little compressed; ribs rugose, cancellated by transverse striæ; hole oval; margin crenated.

There are 15 prominent ribs, with smaller ones between them. Length 22, width and alt. 14 mill. (*Q. & G.*)

Island of Tonga Taboo, S. Pacific.

F. tongana Q. & G., Voy. Astrol. p. 335, t. 68, f. 3, 4.

G. RUPPELLII Sowerby. Pl. 39, fig. 8; pl. 39, figs. 82–85.

Shell elliptical, elevated, the apex decidedly curved forward; front slope concave; posterior slope convex; orifice of a squarish-oblong form, about one-tenth the length of the shell. Sculpture consisting of very numerous subequal or visibly alternating radiating riblets, latticed by close concentric raised threads, forming beads where they cross the riblets. These threads are about 1 millim. apart on the posterior surface.

Color grayish-white, having about 8 broad blackish rays. Interior bluish-white, with narrow radiating white lines; hole callus oval, indistinctly truncated behind. Margin crenulated, the denticulations in pairs. Length 25, width 16, alt. 11 mill.

Red Sea; Mauritius; Cape of Good Hope.

F. rüppellii SOWB., P. Z. S. 1834, p. 128; Conchol. Illustr. f. 65, 75.—REEVE Conch. Icon. f. 54.—SOWB., Thes. p. 197, f. 107, 108.—*F. elevata* DKR. in PHIL., Abbild. ii, p. 67, t. 2, f. 4.—KRAUSS, Die Sudaf. Moll. p. 67.—*F. australis* KRAUSS, *l. c.* p. 67, t. 4, f. 10.—REEVE, Conch. Icon f. 94.—*F. imbricata* SOWB. 2D, Thes. iii, p. 194, f. 162.—*F. nigriradiata* RVE., Conch. Icon. f. 81, 1850.

The strongly elevated apex, curved forward, and the closely, evenly latticed sculpture are characteristic. The hole is squarish-oblong. Figures 82–85 represent the *F. australis* Krauss. *F. elevata* Dkr., described from the Cape of Good Hope, seems to have no differential characters. The *F. nigriradiata* seems to be a young specimen of this species; it might possibly be young *G. listeri.*

G. DUBIA Reeve. Pl. 39, fig. 6.

Shell ovate, attenuated anteriorly, depressed, radiately ribbed, and filled with numerous fine concentric ridges; orifice oblong, rather broad, contracted in the middle; irregularly stained and

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variegated with olive ash. Very closely allied to *F. natalensis* but of much more depressed growth. (*Rve.*)

Port Natal.

F. dubia RVE., Conch. Icon. f. 35, 1849.—SOWB. 2D, Thes. p. 193, f. 208.

G. EXQUISITA Reeve. Pl. 36, fig. 26.

Shell ovate, elevately conical in the middle, scarcely inclined anteriorly, delicately and deeply latticed throughout with radiating and concentric ridges, of which the alternate are smaller and disappear near the orifice; orifice orbicularly ovate, rather small; transparent white. The latticed sculpture of this species is extremely delicate and well-defined. (*Rve.*)

China Seas (Sowb.).

F. exquisita RVE., Conch. Icon. f. 90, 1850.—*F. venusta* RVE., *l. c.* (errata).—SOWB. 2D, Thes. p. 196, f. 109.

Compare *G. singaporensis.*

G. BOMBAYANA Sowerby 2d. Pl. 63, figs. 4, 5.

Oval, depressed, equally cancellated with concentric liræ and acute scabrous ribs; tawny, rayed with brown; white within; margin crenulated; orifice rotund, in front of the middle. A pretty species resembling *F. venusta* but delicately ranged with brown bands and with the costellæ scabrous. (*Sowb.*)

Bombay.

F. bombayana SOWB., Thes. p. 196, f. 166,

G. FUNICULATA Reeve. Pl. 38, fig. 66, (62, 65 vars.)

Shell ovate, narrower in front, perforation in front of the middle, small, oval. Sculpture consisting of close fine radiating riblets, of which about 24 placed at equal intervals are more elevated and prominent, the intervals between these principal ribs bearing usually three smaller riblets; the whole closely latticed by fine elevated concentric threads which are continuous over riblets and interstices, cutting the latter into little pits.

The color is whitish, rayed with pale brown; inside white; hole-callus small, slightly truncated behind; edge finely crenulated.

Length 27, width 19, alt. 9 mill.

Kurrachee, Mouth of the Indus, India.

F. funiculata RVE. Conch. Icon., f. 65, 1850.—*F. indusica* RVE. *l. c.*, f. 67.—*F. dactylosa* RVE. *l. c.*, f. 93.

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Distinguished by the finely latticed and beaded sculpture, having larger riblets at regular intervals.

F. indusica Rve. (fig. 65), and *F. dactylosa* Rve. (fig. 62) from the same locality, are evidently synonymous. This species should be compared with *G. lineata* Sowb. and *incii* Rve.

G. LINEATA Sowerby. Pl. 63, figs. 29, 30; pl. 38, figs. 63, 64.

Shell elliptical, elevated, front slope straight, back slope convex. Sculptured with radiating rounded riblets of which about 18 at equal distances are slightly more prominent, the intervals between them bearing three slightly smaller riblets, and toward the margins in large examples, some small interstitial threads; the whole latticed by slender elevated concentric threads. The more prominent riblets are often pink.

The color is whitish or yellowish, the larger riblets often darker. Inside whitish, with fine white lines. Orifice short-oval, its width two-thirds its length, the latter contained about 11 times in the length of the shell. Hole-callus truncated behind. Edge crenulated. Length 34, width 23, alt. 13 mill.

North Australian Coast.

F. lineata SOWB., Conch. Illustr. f. 68.—Thes. Conch. p. 195, f. 134, 135.—*F. incii* RVE., Conch. Icon. f. 69.

Doubtfully distinct from the later *G. funiculata* Reeve, but the beading is less distinct, the concentric threads wider apart, and with fewer fine interstitial riblets. It is not so finely sculptured as *G. singaporensis.*

G. SINGAPORENSIS Reeve. Pl. 34, figs. 61, 62.

Shell elliptical, rather depressed, the slopes straight, or the posterior slope slightly convex; sculptured with numerous radiating riblets, alternating at the sides and back with smaller ones, latticed by elevated concentric threads about as far apart as the riblets, forming beads where they cross the radii and cutting the interstices into square pits.

Color whitish, with obscure patches of brown. Interior bluish-white, with fine white radiating lines; hole small, oval; about one-tenth the length of the shell; situated in front of the middle; hole-callus truncated behind. Length 17½, width 11, alt. 6 mill.

Singapore.

F. singaporensis RVE., Conch. Icon. f. 100, 101, 1850.—SOWB., Thes. p. 195, f. 118, 119.

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A regularly cancellated species, the altitude about one-third of the length. The specimens before me are from Singapore.

Sowerby has described a F. LATIORA, with the following description but no figure: "Quam *F. singaporensis* multo latiore. I omitted a figure of this, not intending to distinguish it from the preceding, than which, however, it is much broader" (Thes. p. 195).

G. PROXIMA Sowerby 2d. Pl. 63, figs. 15, 16.

Less gibbous posteriorly and less suddenly inclined in front than *F. ticaonica* which it nearly resembles. The variety figured is marked by green lines. (*Sowb.*)

Australia.

F. proxima SOWB. Thes., p. 197, f. 115, 116.

G. LIMA Sowerby 2d.

Similar to *F. aspera* but the concentric and longitudinal lirae much smaller; foramen small, oblong. (*Sowb.*)

Bombay.

F. lima SOWB. Thes., p. 198, f. 124.

G. DIGITALE Reeve. Pl. 36, fig. 27.

Shell orbicularly ovate, gibbously conical, very much inclined anteriorly, very closely decussated throughout with raised concentric and radiating striæ; orifice small, nearly orbicular; deep ash-colored, brown near the base, bluish around the orifice. (*Rve.*)

Habitat unknown.

F. digitale RVE., Conch. Icon., f. 92, 1850.—SOWB. Thes., p. 198, f. 122.

G. TENUISTRIATA Sowerby 2d. Pl. 62, fig. 33.

Oblong, gibbous, white; apex inclined forward; toward the apex minutely cancellated, toward the margin minutely radiately scabrous-striate. Orifice large, round. (*Sowb.*)

Habitat unknown.

F. tenuistriata SOWB. Thes., p. 199, f. 111.

G. CORBICULA Sowerby 2d. Pl. 61, fig. 20.

More depressed than *F. inæqualis*, and *F. pica* with coarser cancellation. (*Sowb.*)

Australia.

F. corbicula SOWB., Thes., p. 200, f. 180.

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G. LANCEOLATA Sowerby 2d. Pl. 61, fig. 19.

The sudden narrowing of the front part distinguishes this from *F. pica* and *F. inæqualis*, besides the cancellation being a little more depressed. (*Sowb.*)

Moreton Bay.

F. lanceolata SOWB., Thes., p. 200, f. 182.

G. ARTICULATA Sowerby 2d. Pl. 63, fig. 11.

Elongate, compressed, tawny, varied with brown bands, cancellated with concentric liræ and radiating, beaded ribs, alternately larger, some of them articulated with black; foramen elongated, far above the middle. (*Sowb.*)

Habitat unknown.

F. articulata SOWB., Thes., p. 200, f. 176.

G. HANLEYANA Sowerby 2d. Pl. 61, fig. 27.

Small, white, subdepressed, narrowed in front, minutely cancellated; white within, margin lightly crenulated; orifice median, subtrigonal, with a little elevated point on each side. (*Sowb.*)

Habitat unknown.

F. hanleyana SOWB., Thes. p. 202, f. 174.

Group of G. gibberula Lam.

Small species with the orifice small, anterior, and the basal side-margins arched, so that the shell rests upon the ends alone. It is not altogether unlikely that *Fissuridea galeata* Helbling belongs here. It may be noted that in the conical species having the apex curved far forward, the truncation or pit behind the hole-callus is indistinct or subobsolete.

G. GIBBERULA Lamarck. Pl. 36, figs. 21, 22, 23, 24.

Shell small, ovate, elevated; anterior slope short, straight, posterior slope long, convex. Sculpture consisting of numerous fine subequal radiating riblets decussated by fine concentric liræ, which cut the interstices into square little pits, and crenulate the riblets at their intersections.

The color is light yellowish, unicolored or with 8 blackish (rarely pinkish) rays. Inside white, showing traces of the fine radiating riblets of the exterior. Edge finely crenulated, the denticles in pairs. Basal margin more or less arched at the sides.

Length 11–12, width 7, alt. 4 mill.

Mediterranean and Adriatic Seas; Atlantic, from England to France, Spain, Canary Is., and Guinea.

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F. gibberula LAM. An. s. Vert. vi, p. 15.—REEVE, Conch. Icon., f. 118, 119.—WEINKAUFF, Conch. des Mittelm. ii, p. 394.—BUQ. DAUTZ. & DOLLFUS, Moll. du Rouss., p. 444, t. 54, f. 1–4.—*F. minuta* O. G. COSTA, Catal. Sist., pp. 120, 123 (not of Lam.).—*F. gibba* PHIL. Enum. Moll. Sicil., p. 117, t. 7, f. 16.—*F. Philippiana* DKR. Zeitschr. f. Mal. 1846, p. 26; Ind. Moll. Guin. Infer., p. 37, t. 5, f. 23–25.—*F. costaria* SOWB. (not Desh.) Ill. Ind. Br. Sh., t. 11, f. 2.

Allied to *F. græca* but constantly far smaller, the apex much nearer the anterior margin, sculpture finer, etc.

The *F. philippiana* Dkr. seems to be synonymous. It is figured on plate 42, fig. 55.

G. dorsata Monterosato is probably a variety. It is an unfigured form, larger than *G. gibba* Phil., and differing in sculpture. Specimens attain a length of 26 mill. It is from Palermo and other points in the Mediterranean. See MONTS., Not. Conch. foss., Monte Pellegrino e Ficarazzi, 1872, p. 28; and Journ. de Conchyl. 1878, p. 148.

G. BENGUELENSIS Dunker. Pl. 42, fig. 56.

Shell ovate-oblong, ovate-conical, yellow, latticed with elevated ribs and decussating transverse riblets; apex excentric, situated at a third part of the length; foramen subrotund, encircled with a purple ring; interior whitish, margin lightly crenulated. Length 5½ lines. Ratio of length, breadth and alt. 100: 60: 30. (*Dkr.*)

Benguela, Guinea.

F. benguelensis DKR., Zeitschr. f. Mal. 1846, p. 27; Ind. Moll. Guin. infer. p. 38, t. 5, f. 9–11.

Allied to F. *græca*, but the radiating ribs close, much less elevated, not nodose; transverse riblets more delicate, not lamellar.

G. MENKEANA Dunker. Pl. 42, figs. 52, 53, 54.

Shell elliptical, very convex, subgibbous in front, whitish banded with rose; radiately ribbed, subclathrate with transverse striæ; vertex obtuse, situated a fourth of the length from the end. Hole small, subrotund; margin crenulated. Length 6–7 lines. (*Dkr.*)

Guinea.

F. menkeana DKR. Zeitschr. f. Mal. 1846, p. 26; Ind. Moll. Guin. Infer., p. 37, t. 5, f. 13–15.

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The ribs are more delicate than in *F. philippiana*, the foramen subrotund, much inclined forward. The ribs are sometimes obsolete, sometimes granulose.

G. ARCUATA G. B. Sowerby Jr. Pl. 62, figs. 31, 32.

Shell small, about the size and shape of *G. gibberula* of the Mediterranean; ovate, narrower in front; very much elevated, the apex decidedly anterior, the front slope short and steep, the posterior slope quite convex; basal side-margins arched, so that the shell rests upon the two ends alone. Surface lusterless, covered with fine subequal or alternating radiating riblets, which are closely but strongly beaded by the otherwise inconspicuous concentric striæ.

Color white, unicolored or rayed with light brown. Inside white; hole-callus wide, not perceptibly truncated posteriorly, margin finely crenulated. The hole is very small, narrow, about one-twelfth the length of the shell. Length 9½, width 6½, alt. 4–5 mill.

St. Thomas, West Indies.

F. arcuata G. B. SOWERBY 2D., Thes. iii, p. 199, f. 163, 164.

This is a very distinct little shell, comparable in its gibbous form and arched side-margins to *G. gibberula* Lam. The sculpture is finer than in that species, however. From the *G. minuta* Lam., the most abundant small species of the West Indies, this convex little form differs notably.

G. MINUTA Lamarck. Pl. 62, fig. 27.

Shell small, oblong, depressed, the sides subparallel, the summit situated at the front third of the total length; front slope straight, posterior slope convex; finely sculptured with radiating riblets (obscurely alternating in size), decussated by numerous fine raised concentric liræ which regularly bead the radiating riblets.

The shell is thin, yellowish or white, having 7 or 8 broad black rays, usually formed of distinct black lines. These rays are visible inside through the thin shell. Hole small, the shape of the shell. Internal hole-callus bordered by a black line; border finely crenulated; basal side-margins more or less arched, so that the shell rests upon the ends alone. Length 10, breadth 5, alt. 2 mill.

Turtle Harbor, Florida to Guadelupe.

F. minuta LAMARCK, An. s. Vert. vi, p. 15.—*F. gemmulata* RVE., Conch. Icon. f. 121, 1850.—ARANGO, Faun. Mal. Cub. p. 228.—DALL, Catal. Mar. Moll. S. E. U. S. p. 170.—*F. minuta* SOWB., Conch. Illustr. f. 16.—SOWB., Thes. iii, p. 199, f. 169. (Not, accord-

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ing to Deshayes, *F. minuta* LAM., see An. s. V., Edit. Desh. vii, p. 599, footnote).

A beautiful little species, having radiating black lines. Deshayes is doubtless wrong in saying that the *F. minuta* of Lamarck is different from the species generally known under that name. See Delessert, *Rec. de Coq.*, for a figure of Lamarck's type.

G. VARIEGATA Sowerby 2d. Pl. 61, fig. 26.

Shell small, oblong, about twice as long as wide; depressed, the back slope a little convex, about twice the length of the front slope. Orifice narrow, long, tripartite. Sculptured with fine alternating radiating riblets crossed by finer concentric threads, continuous over the radii.

Color whitish or buff, with about seven broad dark-brown stripes or spots not reaching to the apex, often coalescent around the base. Interior white, showing the dark maculations; the hole-callus sometimes having a dark horse-shoe shaped boundary, truncated behind. Side-margins slightly arcuate. Length 11½, width 5½, alt. 2⅔ mill.

St. Thomas, W. Indies.

F. variegata SOWB., Thes. p. 200, f. 172, 173.

Allied to *G. minuta* but with the rays not split into lines, the intercostal spaces more distinctly cut into pits, the riblets less distinctly beaded, the orifice not black-bordered outside. I am nevertheless inclined to rank the form as a variety of the *G. minuta*.

G. CANDIDA Sowerby. Pl. 36, fig. 25.

Shell oblong, nearly twice as long as broad, depressed; slope in front of the hole less than half the length of that back of it. Length of hole contained 7–8 times in length of shell. Sculptured with fine alternately larger and smaller radiating riblets, decussated by finer concentric striæ.

The color is white or whitish, sometimes with ill-defined, pale brown rays. Inside white; hole narrow, twice as long as wide; hole-callus distinctly truncated posteriorly; edge of shell very finely crenulated. The side margins are somewhat arched, so that the shell rests upon the two ends alone. Length 15, width 8, alt. 4–4½ mill.

Habitat unknown.

F. candida SOWB. Conchol. Illustr. f. 58.—REEVE, Conch. Icon. f. 89.—*F. angustata* G. B. SOWERBY 2d., Thes. iii, p. 200, f. 170, 171.

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Several specimens of this apparently distinct form are before me. It is far more elongated than *G. gibberula* or *G. arcuata*, and more depressed. In contour *G. minuta* is near to this form, but the orifice of that species is very much shorter.

G. CRUCIATA Gould. Pl. 42, figs. 66, 67, 68, 69.

Shell minute, thin, shining, elongated-ovate, somewhat arched, rounded at extremities, apex elevated at the anterior third, with a key-hole perforation slightly contracted at the sides. Surface sculptured with about thirty elevated, rounded, radiating ribs, for the most part alternately larger and smaller. These are crossed by concentric series of regularly and closely arranged elevated threads, which are slightly imbricated, giving the surface a beautifully cancellated appearance. Colors black and white, arranged so that radiating patches of black corrrespond to the two diameters, and of white to the two diagonals, the latter not continued to the margin. Edge very finely crenulated. Interior white and shining, but blue at the parts that correspond to the black of the exterior. A thick callus fortifies the perforation. Length two-fifths, breadth one-fourth, alt. one-eighth inch. (*Gld.*)

Sooloo Sea.

F. cruciata GOULD, Proc. Bost. Soc. N. H. 1846, p. 155; U. S. Expl. Exped. Sh., p. 365, f. 474.

G. TICAONICA Reeve. Pl. 36, fig. 20.

Shell ovate, gibbously elevated, anteriorly much inclined, slightly hooked; thickly latticed throughout with strong narrow radiating ridges and raised concentric striæ; orifice elongately oblong, sides excavated in the middle; greenish-white sprinkled with dots and blotches of olive-green, bluish around the orifice. An extremely characteristic species, much elevated and curved anteriorly, with the same narrow oblong fissure mostly seen in the flat species. (*Rve.*)

Ticao, Philippines, under stones at low water.

F. ticaonica RVE., Conch. Icon. f. 107.—SOWB., Thes. p. 197, f. 110.

G. CRUCIFERA Pilsbry. Pl. 32, figs. 27, 28, 29, 30, 31.

The shell is regularly elliptical, little elevated, the slopes straight; the 40–45 radiating riblets are equidistant, elevated, narrow and sharp, and are crossed by 12–15 concentric threads of equal

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strength, giving the surface a latticed appearance; between each riblet lies usually a still smaller one, reaching from the margin to about the middle of the slope. The edge is crenulated, the denticles in pairs. Orifice situated two-fifths of the length from the front, small, suboval; hole-callus smooth, blunter behind but without a pit. Color whitish with four triangular brown rays, those at the sides broader. The shell rests upon the two extremities only, so that one can see under it when lying on a flat surface. Length 7·8, width 4·9, alt. 2·4 lines. (*Krauss.*)

Natal.

F. cruciata KRAUSS, Die Sudafric. Moll. p. 67, t. 4, f. 9, 1848.—REEVE, Conch. Icon. f. 96.—SOWB., Thes. Conch. p. 201, f. 291. (not *F. cruciata* Gould, 1846).

Group of G. viridula.

Concentric sculpture subobsolete; color greenish.

G. VIRIDULA Lamarck. Pl. 62, figs. 22, 23, 24, 25.

Shell oval, elevated, the slopes nearly straight, summit in front of the middle; sculptured with separated, closely nodose or subnodose ribs, having usually inconspicuous intermediate riblets; *no concentric liræ.* Greenish, unicolored or with the principal radiating ribs whitish; *bluish-black around the orifice both outside and within.*

The margin is finely crenulated; inside white; hole-callus blackish or encircled by a black line. Principal ribs of the outside about 20 in number. Length 26, breadth 17, alt. 10 mill.

St. Thomas, Antigua, Jamaica, etc., West Indies.

F. viridula LAM. An. s. Vert. (ed. Desh.) vii, p. 596.—SOWB. Conch. Ill. f. 13.—REEVE, Conch. Icon. f. 25.—SOWB. Thes., p. 198, f. 62.—*F. bicolor* C. B. AD.

The obsolescence of concentric sculpture in the intervals between the ribs and the blue-black summit are the prominent characters of this species. The beading of the ribs is variable, often nearly obsolete.

G. TEGULA Reeve. Pl. 34, fig. 56.

Shell ovate, conical, front slope straight, back slope straight below, becoming arcuate toward the summit. Sculptured with low alternately smaller, slightly beaded radiating riblets; concentric striæ sub-obsolete.

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Color slate-blue with numerous (about 20) narrow blackish-green rays some of them often split into lines. Hole twice as long as wide, indistinctly tripartite, about one-eighth to one-ninth the length of the shell, and situated in front of the middle. Interior bluish, the hole-callus bounded by a black line, and very distinctly truncated behind. Edge a little crenulated. Length 17, width 11¾, alt. 7 mill.

New Guinea.

F. tegula RVE. Conch. Icon., f. 122, 1850.—SOWB., Thes., p. 198, f. 57, 58.

A slate-colored species, black-rayed and having the concentric sculpture nearly obsolete.

* * *

Species of doubtful position.

G. ? MONILIFERA Hutton. *Unfigured.*

Ovate, white, radiated with moniliform ribs and obscurely cancellated; border smooth or crenulated. Height ·2, length ·6, breadth ·45 inch. (*H.*)

Stewart's Id., 15 *fms.*

Lucapina monilifera HUTTON, Cat. Mar. Moll. New Zealand, 1873, p. 42; Journ. de Conchyl. 1878, p. 35; Manual of N. Z. Moll. p. 106, 1880.

May be a *Megatebennus*, but the description is not sufficiently detailed to enable one to classify it.

G. ? SCROBICULATA Nevill. Pl. 41, fig. 38.

Shell small, depressed, almost regularly oval, the sides a little narrowed in the middle, rounded in front and behind; white, with scarcely distinct, brownish, radiating bands. Surface all over minutely pitted and ornamented with subobsolete radiating striæ; foramen wide-oval, surrounded by an elevated margin; margin of the aperture thin, minutely crenulated. Inside white. Length 9½, breadth 5¾, alt. 2½ mill. (*Nev.*)

S. province Ceylon.

Fissurella (?) scrobiculata NEVILL, Journ. Asiat. Soc. Beng. xxxviii, p. 163, t. 17, f. 15.

The sculpture of this interesting shell is very peculiar, the surface being covered with rough diamond-shaped scrobiculations, perhaps

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caused by its being covered by the mantle of the animal. (*Nevill.*)

This is a species of doubtful position. The description of the sculpture suggests that it may belong near *Megatebennus* (*Amblychilepas*) *concatenata* C. & F.

G.? CANALIFERA Nevill. Pl. 41, fig. 37.

Shell ovate-elongate, narrowed in front and turned up at the end; rather solid, ornamented with unequal radiating striæ and roughened with concentric lamellæ; pale brownish, radiately marked by a few elongated obscure patches; foramen long, subcentral, rounded in front and behind; inside whitish; margin of the aperture rather obtuse, nearly simple, minutely crenulated, insinuated in front; margin of the foramen a little thickened, rather obtuse. Length 14, breadth 7½, alt. 4¼ mill. (*Nev.*)

S. province Ceylon.

F. canalifera G. & H. NEVILL, Journ. Asiat. Soc. Bengal, xxxviii, p. 163, t. 17, f. 13.

Easily distinguished from any other species of *Fissurella* by the curious way in which the shell, at the anterior end, is turned up and contracted, thus forming a sort of canal interiorly; the black stripes in position also seem tolerably constant, there being two broad ones radiating from the posterior end of the foramen, and the same number but narrower and more indistinct, from the anterior end. (*Nevill.*)

Genus PUNCTURELLA Lowe, 1827.

Puncturella LOWE, Zoological Journal iii, p. 77, 78, type *Patella noachina* L.—A. ADAMS, P. Z. S. 1851, p. 227.—FORBES & HANLEY Brit. Moll. ii, p. 473, 1853.—WOODWARD, Manual Moll., p. 150, 1853.—DALL, Bull. Mus. Comp. Zool. xi, p. 74, 1881, and of FISCHER, WATSON, JEFFREYS and others.—*Cemoria* LEACH (MS., 1819), Moll. Gt. Br. (Gray's edit.), p. 213, 1852, and of H. & A. AD., Gen. Rec. Moll. i, p. 450, and of some others, *not Cemoria* RISSO, 1826.—in part *Diodora* GRAY, 1840 (no descr.), not *Diodora* GRAY, 1821 (= *Glyphis* juv.).—*Diodora* "Gray" BLAINV., Manuel i, p. 501 (no descr.).—*Sipho* BROWN, Ill. Conch. Gt. Br., t. 36, f. 14–16, 1827, not *Sipho* Klein, Fabr. nor Mörch.

The name *Puncturella* has been adopted by all recent writers on this genus. Dr. Dall (*l. c.*) has discussed the synonymy in detail.

The genus consists of small conical shells having a spirally recurved apex either persistent or absorbed in the adult, the fissure

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either lanceolate or oval, on the front slope or at the summit of the cone; inside there is a plate extending forward forming a conduit to the fissure or a "deck" over it.

The spiral apex is inclined toward the right side, and the fissure is also a trifle to the right of a median line, when visibly excentric. The surface usually shows minute granules under a strong magnification.

The tentacles are short and stout; eyes with or without pigment; epipodial row of papillæ present. In many of the species a male intromittent organ is present, behind the right tentacle. The rows of teeth across the radula are oblique, not transverse, the individual teeth being oblique, so that it is bilaterally asymmetrical.

This is mainly a deep sea group. It differs from *Rimula*, *Emarginula*, etc. in having a septum or deck inside; from *Glyphis* in having no distinct internal callus around the front of the fissure; from *Zeidora* in having the fissure closed, not an open anterior slit.

Puncturella divides into three sections, which, although used in a generic sense by some authors, have only slight systematic value.

1. Apex persistent; the fissure in front of it.
   a. Fissure at the summit, - - Section *Puncturella s. s.*
   b. Fissure half way between summit and front margin, Section *Cranopsis.*
2. Apex absorbed in the adult by the short oval fissure, Section *Fissurisepta.*

Section *Puncturella* s. str.

Herein are included species having the recurved apex persistent in the adult; the fissure at or near the summit; the internal plate with or without side-props.

P. NOACHINA Linné. Pl. 27, figs. 69, 70.

Shell oval, elevated, about as high as broad; slopes nearly straight; the summit in the middle, apex curving downward behind it, showing a minute spiral whorl on the right side. Fissure situated at the summit, narrow. Sculptured with alternately larger and smaller radiating riblets which are slightly irregular but scarcely beaded, and seen under a strong lens to be studded with minute white specks. Color yellowish-white.

Interior bluish; septum small, strongly arched, forming a narrow passage to the slit, strengthened by a low buttress on each side.

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Length 7, breadth 5¼, alt. 4½ mill.

Circumpolar; southward to Cape Fear (in deep water); to Scarborough, England; to Corea and northern Japan; to Puget Sound, West America. In the Southern Hemisphere, off Marion Island, 69 *fms.; off Prince Edward's Island* 310 *fms.; Kerguelen,* 60 *fms.; Strait of Magellan.*

Patella noachina L., Mantissa, p. 551.—*Puncturella noachina* LOWE, Zool. Journ. iii, p. 78, 1827, and of authors generally.—*Cemoria princeps* MIGHELS, Proc. Bost. Soc. N. H. 1841, p. 49.—*Rimula galeata* GOULD, U. S. Expl. Exped. p. 369, t. 31, figs. 476, 477.

A very widely distributed species, of a more erect elevated form than its allies.

Var. GALEATA Gould. Pl. 42, figs. 62, 63, 64, 65.

Rather heavier and larger; buttresses of the internal septum strong, forming a deep pit on each side of the hole-channel; a groove running downward from the hole inside.

Length 10½, breadth 8¾, alt. 6½ mill.

Puget Sound.

P. FASTIGIATA A. Adams. Pl. 63, figs. 31, 32.

Whitish, elevated-conical, shining, the acuminate vertex involute; having radiating equal, equidistant riblets, interstices flat with concentric striæ of growth. Fissure lanceolate; aperture oval, margin crenulated, septum deeply arcuate, transverse, simple. (*Ad.*)

Eastern Seas.

P. fastigiata AD., P. Z. S. 1851, p. 228.—*Cemoria fastigiata* AD., Thes. p. 208, f. 15, 16.—SOWB. in Conch. Icon. xix, f. 4.

P. COGNATA Gould. Pl. 42, figs. 70, 71.

Shell small, conical, with the apex curved and the surface ornamented with radiating ribs of nearly uniform size; aperture rounded-oval. Color ashy-white. (*Gld.*)

Orange Harbor, in 16 fms.

Compare *P. noachina.*

P. CONICA Orbigny. Pl. 63, figs. 40, 41.

Shell oval, much elevated, conic, thin, white, ornamented with alternately larger and smaller ribs, one in front larger than the

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others. Apex strongly recurved. Margins nearly entire. Length 4 mill.

Falkland Is.

Rimula conica ORB., Voy. dans l'Amér. Mérid. p. 471, t. 78, f. 10, 11.

P. NOBILIS A. Adams. Pl. 63, figs. 34, 35, 36, 37.

Elevated-conical, vertex acuminate, inclined, acute; radiating ribs strong, equidistant, interstices concentrically striated. Fissure narrow, lanceolate. Margin deeply crenulated. Resembling *C. cucullata* Gould, but with the ribs stronger, wider apart and equal; the apex moreover is considerably more elevated and acute. (*Ad.*)

Okosiris, Japan.

Cemoria nobilis AD. in Thes. Conch. iii, p. 208, f. 6–9.—SOWB. in Conch. Icon. xix, f. 6.

P. FALKLANDICA A. Adams. Pl. 63, fig. 33.

Whitish, conical, apex incurved; radiately ribbed, ribs strong, subdistant, equal, corrugated by close concentric striæ. Fissure narrow, lanceolate; aperture ovate, margin crenated. In this species the ribs are very distinct, and the concentric raised lines are acuminate where they cross the ribs. (*Ad.*)

Falkland Is.; West coast of Patagonia, 449 fms.

Cemoria falkandica AD. in Thes., p. 208, f. 14.—SOWB. in Conch. Icon., f. 8.—*Puncturella falkandica* DALL, Rep. Albatross Moll., in Proc. U. S. Nat. Mus. xii, 1889, p. 356.

Differs from *P. noachina* only in the generally shorter fissure, septum shorter, more vertical, apex less posterior, but is doubtfully distinct, according to Dr. Dall. The animal has a well marked verge.

P. COOPERI Carpenter.

Almost exactly like *P. galeata*, but the internal plate solid, plane, scarcely anteriorly sinuate, scarcely propped.

Outside like *P. noachina*, but with the lamina like *P. cucullata*, without eye-holes [accessory lateral pits]. The latter species is extremely variable in sculpture but never so fine as this; and the shape is less conical. Length 0·30, width 0·21, alt. 0·24 inch. (*Cpr.*)

Catalina Island, Cal., not rare, 20–40 fms.

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P. cooperi CPR., Moll. of Western N. A. p. 137, Smithsonian Misc. Coll. 252; Proc. Cal. Acad. N. S. iii, p. 214, 1865.

P. CUCULLATA Gould. Pl. 42, figs. 72, 73, 74, 75; pl. 63, figs. 38, 39.

Shell large for the genus, short, oval, conical, the recurved apex about in the center, fissure in front of the summit, wedge-shaped, rather short; slopes straight; sculptured with numerous radiating riblets, every fourth one larger, or in younger shells every alternate one larger; having rather coarse concentric striæ.

Interior white; septum short, arched, without buttresses, not concealing the fissure, which continues downward in a groove which does not extend to the edge of the shell.

Length 22, breadth 18, alt. 12 mill.

Monterey; Puget Sound; Neeah Bay.

Rimula cucullata GLD. Proc. Bost. Soc. N. H. ii, p. 159, 1846; U. S. Expl. Exped. Sh., p. 368, f. 475.

The largest species. The short, arched septum, without side buttresses, and the shorter fissure separate this from *P. noachina*, etc. The fissure is wedge-shaped, acute anteriorly, rounded behind.

P. CLATHRATA Jeffreys. Pl. 27, figs. 66, 67.

Shell small, porcellanous, oblong, scarcely perceptibly broader in front; its slopes are conical and straight till close to the top, which projects backwards but little; there are strongish ribs and still stronger concentric threads; the slit is short and broad. Sculpture: there are about 35 strongish rounded riblets with feebler ones between, bringing up the total number to 60 or 70; overlying these, and forming minute knots at the crossings, are rather stronger, concentric rounded threads, giving to the surface a wattled appearance. Color faintly brownish-gray. Apex rather coarse, curled in, but very little reverted or flattened; there are just two whorls in all. Slit oblong, being short and broad; as seen from without, one-half is open leading into the interior, the other is closed by the very curved septum. Margin crenulated and crimped by the ribs. Inside glassy, blunt at the top, not being hollowed into the apex, strongly furrowed by the ribs, less so by the concentric threads; there is no anterior furrow seen from within, the slit is semi-oval, and the strong septum is excessively short and straight and is almost perpendicular; from it a slight callus encircles the opening of the slit. Length 0·25, width 0·16, alt. 0·13 inch. (*Wats.*)

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This species in form somewhat resembles *P. agger*, but is longer and narrower; the sculpture and slit are very markedly, and the apex unmistakeably, different. In all these respects it differs from *P. noachina*, to the young of which it has a vague resemblance. That species also is usually in all stages of growth narrower in front than behind. I failed to recognize either the white or transparent specks one or other of which are generally present in the *Fissurellidæ*. (*Wats.*)

North Atlantic; Culebra Id., W. Indies, 290 fms.

P. clathrata JEFFR. P. Z. S. 1882, p. 676, t. 1, f. 11.—WATSON Challenger Gastrop., p. 39.

P. AGGER Watson. Pl. 26, figs. 32, 33, 34, 35.

Shell small, porcellaneous, oval, broader in front; sides slopes straight, the front convex, the back concave rather high, but with the top depressed and thrust out backwards, yet little projecting, the apex being flattened out on the posterior slope; there are many not crowded slight radiating ribs set with stumpy prickles; the long and lanceolate slit is on the crest, and from it a ridge runs down the front slope. Sculpture: The riblets are very slight, but are made distinct by the little triangular prickles which pretty closely stud them; these prickles more irregularly and remotely tally with feeble lines of growth; the ridge down the front slope is small, and is crowned with two of the riblets parted by a narrow furrow; these riblets along the slit rise into sharp laminæ. Color: The shell is porcellanous white, with a slight ruddy tinge. Apex somewhat depressed and shortly projected backward, curling in on the central line of the shell, but with the extreme tip flattened out on the posterior right slope. There are 2¼ whorls in all. Slit lies high on the front slope, distant from the apex about once, and from the margin about twice its own length. It is long and narrow, bluntly rounded at the upper end, and produced in front to a long sharp point. Margin is thin and not fretted with the rib ends. Inside glassy, deeply hollowed into the apex, feebly rayed, and having the rays picked out with bright specks corresponding to the eternal prickles; a long shallow furrow, bordered by a minute ridge on either side, runs widening upwards from the margin to the slit, which is covered in all its length by the somewhat contracted, sinuous edged, cross scored, straight, glassy septum, which arches in to the apex.

Length 0·17, breadth 0·13, alt. 0·09, inch. (*Wats.*)

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The species has somewhat the form of *P. granulata* Seg., but is not so compressed, and the sculpture is quite different. (*Wats.*)

North of Culebra Id., West Indies, 390 fms.

P. agger WATS. J. L. S. L. xvii, p. 32; Challenger Gastrop., p 40, t. 4, f. 6.

P. BRYCHIA Watson. Pl. 26, figs. 38, 39, 40, 41.

Shell very small, porcellanous translucent, oval, very slightly broader in front; its side slopes are slightly, its front slope extremely convex, its back slope is short and flattened, and very much overhung by the protuberant apex; there are sparse and distinct riblets. The slit is short and coarse, though not large; and from it a broad round ridge trending to the right runs out to the margin. Sculpture: The riblets are neither strong nor sharp; but they are distinct, rising as little round threads from the flat surface, and being parted by broad intervals, rather strongly pitted by the little specks of the genus; the ridge which runs down the front of the shell is the full breadth of the slit; the concentric striæ are mere slight irregular lines of growth.

Color clouded, porcellanous white under the brownish caducous epidermis. Apex very much curled in and bent down, but not spread out on the backward slope; the minute extreme tip is exserted and projects; the whorls are 2¼. Slit: The open part is short and narrowly oblong, and as broad in front as behind, from which point the old scar runs up the crest. Margin thin, patulous, especially behind, crenulated by the riblets. Inside porcellanous, deeply hollowed into the apex; scored by the rib-furrows, of which the one in front is very strong, particularly near the slit, which is rather closely covered by the strong, slightly arched septum, which has a retracted edge and is unbuttressed.

Length 0·18, breadth 0·12, alt. 0·1 inch. (*Wats.*)

In the animal the eye-peduncles are present; but no eyes are visible. The pedal papillæ are very small, as is also the funnel-shaped process leading to the shell-slit.

This species in general form is a good deal like *P. agger*, but is more tumid and higher; the apex and sculpture are very dissimilar. Than *P. conica* d'Orb., which is much of the same size, *P. brychia*, has the apex much more turned over; the form is broader and much more depressed. (*Wats.*)

Off Halifax, N. S., 1340 fms.

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P. brychia WATS. J. L. S. L. xvii, p. 32; Challenger Gastrop., p. 41, t. 6, f. 7.

P. OXIA Watson. Pl. 26, figs. 46, 47, 48, 49.

Shell very small, thin, oval, narrowed in front, depressed; its slopes are straight at the sides, slightly and regularly convex in front; merely the extreme tip is curled in, and the top projects sharply upward and backwards immediately in front of the break of the slit; the surface is closely dotted with minute tubercles; the slit is rather large and round. Sculpture: There are neither ribs nor concentric lines, but the surface is pretty closely dotted over with minute rough tubercles, which are arranged in somewhat interrupted and irregular zig-zags. Color translucent, and at the tubercles transparent. Apex incurved and turned back, but not bent down; there are two whorls. Slit: There is a largish round hole obliquely cut off from the top and prolonged backwards into a point. Margin very thin, patulous, not crimped. Inside glassy; a very small hollow runs up into the apex; the surface is scored with many irregular minute scratch like white threads, which are more perceptible on a slightly worn than on a fresh specimen; there is no anterior furrow; the slit, as seen from within, is round, and is very little interfered with by the short, thin, triangular, straight-edged almost perpendicular septum. Length 0·14, breadth 0·1, alt. 0·07 inch. (*Wats.*)

This species has some features of resemblance to *P. profundi* Jeffr., but is flatter and in sculpture is quite different. (*Wats.*)

Off Culebra Islands, West Indies, 390 fms.

P. oxia WATS., J. L. S. L. xvii, p. 36; Challenger Gastrop. p. 44, t. 4, f. 8.

P. SPORTELLA Watson. Pl. 26, figs. 42, 43, 44, 45.

Shell very small, strongish, oblong, with straight slopes before and at the sides, and markedly concave behind; the apex is very small, and it alone projects backwards; the surface is finely cancellated; the slit is lozenge-shaped. Sculpture: There are very many slightly irregular, coarsish radiating riblets crossed by concentric threadlets, which are rather finer and closer but somewhat more irregular, and which form minute knots in crossing the riblets; from this sculpture results the basket-work appearance from which the name of the species has been adopted. Color white, with a faint tinge of ruddiness. Apex is exceedingly minute; and it is the little embryonic

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spiral alone which projects; the entire number of whorls is only 1¼. Slit roundish, but acute in front, and drawn out behind (where it is closed by the septum) into a sharp point so as to be lozenge-shaped when viewed in its entire length. Margin straight on the sides, scarce appreciably broader behind than before; the edge is bevelled off so as to be quite sharp. Inside glassy; feebly marked with the ribs, which as well as the concentric threads, shine through as transparent; the opening up into the apex is narrow and deep, but not pointed; there is no anterior furrow; the slit as seen from within is roundish, pointed in front, and truncated behind by the short, thin triangular, straight-edged, little oblique septum.

Length 0·12, breadth 0·08, alt. 0·06 inch. (*Wats.*)

This beautiful species is not improbably full grown, the very small apex seeming to indicate that the species is in its own nature minute. In outline it somewhat resembles *P. granulata* Seg.; in sculpture it has relations with *P. asturiana* Fisch., and *P. profundi* Jeffr.; in both respects it may be compared with *P. clathrata* Jeffr., but is unlike them all, and may be readily recognized by its minute apex. (*Wats.*)

Off Culebra Island, West Indies, 390 fms.

P. sportella Wats. Journ. Linn. Soc. Lond. xvii, p. 37; Challenger Gastr., p. 45, t. 4, f. 9.

P. circularis Dall. Pl. 25, fig. 31.

Shell white, acutely conical, with the anterior wall slightly, and the posterior wall strongly, concave; tip sharply recurved, acute, not spiral, directed backward in the middle line; surface ornamented with about forty very slender radiating lines, fewer toward the apex, with intercalary threads toward the margin; concentric sculpture consisting of extremely delicate, irregularly disposed aggregations of the lines of growth, which now rise above, and now fall below the general plane of the surface, giving it under a strong magnifier a curiously malleated appearance, between the radiating threads, nowhere exhibiting any uniform concentricity; where the lines of growth cross the radiating threads they form fine overlapping scales closely appressed to the threads; puncture ovate, pointed behind; margin thickened, perfectly smooth; septum triangular, inclined forward under the puncture which it almost entirely hides when viewed from below; basal edge subcircular. Lon. 5·75, lat. 5·0, alt. 3·0 mill. (*Dall.*)

Florida Strait; West Indies, 539 fms.

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P. circularis DALL, Bull. M. C. Z. ix, p. 75, 1881; Blake Gastrop., p. 403, t. 26, f. 7, 7b.

P. WATSONI Dall.

Shell small, greenish-white, exactly resembling in sculpture Cranopsis granulata Seguenza (See p. 242, pl. 25, fig. 28); but differing from that species in having the slit of Puncturella instead of Cranopsis, and in having a rather higher and narrower and more conical form. The anterior and posterior slopes are not arched to the same extent as in the *C. granulata*, and the shell is proportionately shorter. The nucleus is small and prominent, and the shell as a whole includes two whorls. Max. alt. 3·0; max. diam., 2·5; max. lon., 3·8 mill. (*Dall.*)

Near Barbados, in 100 fms.; *off Bahia Honda, Cuba*, 220 fms.; *off Yucatan*, 200 fms.

P. Watsoni DALL, Blake Gastrop., p. 403.

P. TRIFOLIUM Dall. Pl. 27, figs. 50, 51.

Shell brownish-white, acutely conical, with anterior and posterior walls nearly straight, except near the tip where they are slightly concave, especially the latter; tip erect, squarely truncated at the top, not twisted, inclined or recurved; surface ornamented with some twenty-four to thirty strongly elevated rounded ribs, smooth for the most part, but undulating a little as they pass over the concentric sculpture and rarely and irregularly spinous; these spines do not exceed two or three on any rib, occur only on the stronger ribs, and are short, pointed, solid and acutely triangular; between the primary radiating ribs are secondary ones about equal in number, but not spinous and not raised above the concentric sculpture; the latter is not strictly concentric except in a general sense, and consists of stout spongy bands connecting the ribs, passing from base to base between each pair of primary ribs on a level with the secondaries, but not evenly continuous clear around the shell, and having a pumice-like texture, so that the bands are not defined sharply like the ribs; the spaces left vacant by this reticulation are rather deep and have a worm-eaten appearance; shell inside smooth with shallow grooves indicating the stronger external ribs and with a striated space over the head between the anterior horns of the scar of the great pedal muscle. Puncture externally circular, as in *Glyphis*, internally trefoil-shaped from the projection of the middle of the septum and two little shelly knobs on each side into the space;

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septum triangular, very small and short, inclined in about the same plane as the anterior wall of the shell, in the middle of its lower edge produced and thickened like a little short tongue; about half way between the base of the septum and the outer upper surface of the perforation inside the tube, and at about equal distances from each other and from the median line of the septum, are two little shelly triangular projections which give to the interior of the apex, when looked through, the trilobate outline referred to in the specific name; base of the shell ovate, the margins showing projections and indentations corresponding to the sculpture of the exterior. Lon. 14·0, lat. 10·5, alt. 7·0 mill. (*Dall.*)

Yucatan Strait, 640 fms.

P. trifolium DALL, Bull. M. C. Z. ix, p. 76, 1881; Blake Gastrop. p. 403, t. 26, f. 8, 8b.

P. ERITMETA Verrill. Pl. 27, figs. 60, 61.

Shell small, thin, delicate, translucent white, glossy, moderately elevated, with the base between elliptical and ovate, somewhat narrowed anteriorly, having both ends evenly rounded and the sides somewhat compressed, but still moderately convex. The apex is minute, nearly central, compressed, turned backward, but scarcely incurved, and with the extreme tip smooth and glossy. The pore is very small, situated very close to the apex, and it appears to be divided by a slight transverse septum, across the middle. The sculpture consists of very numerous radiating striæ, which are decussated by fine and close, raised regularly concentric lines of growth of about the same size as the radii on the upper portion, where the shell is minutely cancellated, but on the lower part of the shell the concentric lines become larger and more distant, and have the form of regular raised cinguli; the intervals between these, which are two or three times as wide as the ridges, are crossed by the much finer and closer radiating lines, which do not produce a regular cancellated appearance on this part. Both the radiating and longitudinal lines are so fine as scarcely to be visible without a lens. Internally the surface is nearly smooth and lustrous, and the external sculpture shows through the substance of the shell. In the apex there is a minute transverse lamina, forming a small flattend tube. The anterior slope of the shell, seen in profile, is broadly rounded; the posterior slope falls off abruptly at first, near the apex, and then slopes regularly to the posterior margin, with a nearly

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straight or but slightly convex outline. The side slopes are steep, regularly and slightly convex.

Length 5, breadth 3, height 2 mill. (*Verrill.*)

Off Rhode Island, 1451 fms.

Puncturella (*Fissurisepta*) *eritmeta* V., Trans. Conn. Acad. vi, p. 204, t. 32, f. 19, 19a.—*P. eritmeta* DALL, Catal. Mar. Moll. S.-E. U. S., p. 170.

P. ABYSSICOLA Verrill.

Shell moderately large, elliptical or ovate in outline, a little narrowed anteriorly, evenly convex along the sides, and rounded posteriorly, moderately elevated, with the apex small, not very prominent, acute and curved backward and inward, situated a little behind the middle. The posterior slope is at first a little concave, owing to the position of the beak; the anterior slope is gently convex. The foramen is elongated fusiform, broadest in the middle, tapering both ways to acute points, but most acute anteriorly; its posterior end does not reach the vertex and terminates some distance from the apex; it is thickened and partly filled up within. A slightly elevated ridge runs from the anterior end of the opening to the front end of the shell, but is scarcely larger than the other ribs. The sculpture consists of about forty rounded, moderately elevated, nodulous, radiating ribs, with an alternating series of similar but smaller ribs on the lower half. The surface is covered with concentric, raised lines, which are nearly as prominent as the radii, producing a cancellated structure and forming the small rounded nodules where they cross. The internal septum is highly developed, large, strong and tubular, extending down in front farther than the foramen, with narrow lateral ridges extending nearly to the front edge of the shell. The edge of the shell is thin and slightly crenulated by the ribs. Length 10, greatest breadth 7, height 5, anterior edge to apex 8, posterior edge to apex 4·5, length of foramen 1·6 mill (*Verrill.*)

N. lat. 39° 03′ 15″, *W. long.* 70° 50′ 45″, in 1537 fms.

P. abyssicola VERRILL, Trans. Conn. Acad. vi, p. 425.

This species differs from *P. noachina* in being much less elevated, with the sides not flattened; in having the apex less prominent and farther back; in the distinctly and rather coarsely cancellated structure; and in having a broader and more fusiform foramen, situated more anteriorly and not extending so far toward the apex;

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the internal septum is larger and more flattened and prolongations extend from its anterior edges nearly to the anterior edge of the shell. It seems to be very distinct from all the species described by Watson, Jeffreys and Dall. (*Verrill.*)

P. ERECTA Dall.

Shell stout, erect, high, rather short, white or grayish, reticulated; apex minute; nucleus smooth, of a single whorl; radiating sculpture of three series of threads, the strongest alternating with the secondaries and these with the tertiaries, which last are almost hidden under the concentric sculpture, which consists of round, even, uniform, equally spaced threads clinging closely to and passing over the radii like cords over a rod; apex at the posterior third, from which the posterior slope is straight and steep; anteriorly the top is arched, then falls steeply to the front edge; slit elongate, with its outer edges raised, a suture in front continued to the front edge, corresponding to an internal groove which does not indent the margin; perforation long and narrow, contained in the upper half of the anterior dorsum; internally there is no true septum, but a rim of shelly matter like a collar is pushed back behind the orifice as if the latter had been made by pushing a pin in from the outside and pressing it backward; interior of shell white, muscular impression strong, margin of shell slightly crenulated by the sculpture; maximum longitude of the shell 10, latitude 7·5, altitude 6·8 mill. (*Dall.*)

This is one of those intermediate forms which bridge over the gaps between subgenera. It has exactly the sculpture of some varieties of *Cranopsis asturiana*, but its apex is smaller and more close-set, the form of the shell different, the perforation nearer the apex of the shell, and the shell itself is solid and strong, while the *C. asturiana* is delicate and thin. It is difficult to say whether the present species should be called a *Puncturella* (*s. s.*), a *Cranopsis* or a *Rimula*. (*Dall.*)

Off North Carolina in 107 fms.

Cranopsis ? erecta DALL, Blake Gastrop., p. 405.—*Puncturella (? Rimula) erecta* DALL, Proc. U. S. Nat. Mus. xii, p. 357, 1889.

Section *Cranopsis* A. Adams, 1860.

Cranopsis AD. Ann. Mag. N. H. 1860, p. 302, type *C. pelex.*—AD. & SOWB. Thes., p. 208.—SOWB. in Conch. Icon. xix.—WATSON,

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Challenger Gastrop., p. 38.—FISCHER, Manuel, p. 862.—DALL, Blake Gastrop., p. 404.

Differs from *Puncturella s. s.* in having the fissure upon the front slope instead of at the summit.

P. PELEX A. Adams. Pl. 28, fig. 8.

Shell cap-shaped, ornamented with radiating crenulated liræ, the interstices cancellated; fissure chambered within, margins callous, outside bordered with elevated longitudinal lips. Margin crenulated. (*Ad.*) Length 5 mill.

Off Mino-Sima, Straits of Corea; 63 fms.

P. pelex AD. Ann. Mag. N. H. v, 1860, p. 302.—Thes. Conch. iii, p. 209, f. 34.—SOWB. in Conch. Icon. xix, f. 2.

P. PILEOLUS A. Adams. Pl. 28, fig. 9.

Cap-shaped, with radiating crenulated riblets, the interstices cancellated; vertex strongly curved backward; fissure acute in front, back margin reflexed. This species is more cap-shaped and the apex more involute than in *C. pelex;* it is also more laterally compressed and of smaller size. (*Ad.*) Length 3½ mill.

Off Mino-Sima, Japan.

P. ASTURIANA Fischer. Pl. 26, figs. 36, 37.

Shell gray, thin, depressed, oval, considerably broader in front than behind; with straight conical sides, convex in front and concave behind, where in particular the margin is a little patulous; it is scored with sharpish ribs and concentric threads; the lanceolate slit is large and very low placed. Sculpture: From the point 30 to 40 sharpish ribs radiate out, in whose interstices as they diverge smaller ones appear, which finally rival the first, so that toward the margin 100 to 130 can be counted. The one in continuation of the generic puncture is slightly raised, double and partially split, especially above, giving the impression of a suture; these are crossed by concentric threads of almost equal strength with the ribs, in crossing which they rise into knots which sharply roughen the surface. Color brownish-grey; but the specimen is sonewhat blackened and discolored. Apex a good deal depressed, curled in and projected backwards exactly in the middle line of the shell, the minute tip just standing out on the right, forming a spire of 2¼ whorls. Slit very low, having its center quite two-thirds down the front slope; it is lanceolate, square behind, broadening a little

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irregularly in the middle and slowly contracting to a small narrow point in front. The old scar is a shallow furrow with sharp sides; and the bottom is scored across with old edge-lines. Margin thin, toothed and crimped on the edges by the ribs. Inside porcellanous, somewhat indented on the line of the ribs. The apex is deeply hollowed; a deepening and widening groove extends from the margin to the slit, which is shortly covered by the regularly curved, strong, unbuttressed septum. Length 0·8, breadth 0·62, alt. 0·32 inch.

This North Atlantic species is exceptionally large. In outline it somewhat resembles *Rimula cognata* Gould. My remembrance of that species is that it is quite small; but Gould figures it large and gives no indication of size beyond saying that it is small. *P. asturiana* further differs from it in being much rounder and lower with a more depressed and reverted apex, and a slit much more remote from the top.

Bay of Biscay, 600–1100 fms.; *Gulf of Mexico*, 85–640 fms.

Rimula asturiana FISCHER, Journ. de Conchyl 1882, p. 51.—*Puncturella* (*Cranopsis*) *asturiana* WATS., Challenger Gastr. p. 45. t. 4, f. 4.—*Cranopsis asturiana* DALL, Blake Gastrop. p. 404.

Dr. Dall has demonstrated the presence of a verge in this species.

P. GRANULATA Seguenza. Pl. 25, fig. 28.

Shell porcellanous white under a meagre yellow epidermis, rather thin, narrow, broader in front, oblong, with a depressed and reverted top and incurved apex; the side slopes are steep and slightly convex, the front edge is long and very convex, the back slope is concave in consequence of the overhanging apex; the small close-set radiating ribs are beaded with contiguous small rough tubercles; the long narrow fusiform slit rises very high, and is remote from both apex and margin. Sculpture: From the apex over 100 small irregular and unequal riblets radiate to the margin; they are closely beset with small rough tubercles like beads; there are no concentric threads, but a few unequal lines of growth can be seen; the riblet which runs from the slit is double, with a minute furrow between the riblets; its direction is not quite constant in different specimens. Color: The shell is pure white, porcellanous under the thin straw-yellow membranaceous epidermis, which is rather caduous. Apex very much reverted and depressed so as to stick out backwards bluntly, but prominently in the mid-line of the shell; the minute smooth white tip stands out on the right with considerable distinct-

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ness, completing a regular spire of 2½ whorls in all. Slit stands very high, its upper end rising to the crest of the shell, though still remote from the apex; it is long, narrow and deep, and tapers off at both ends; the old scar is deep and narrow. Margin thin and sharp, toothed all around, but hardly crimped within; behind it is very patulous, but elsewhere the internal slope is very steep; the two sides are very straight and converge backwards. Inside porcellanous, deeply hollowed into the apex; a sharp little furrow that resembles a crack runs up from the margin to the slit, which is almost quite covered in all its length by the patulous but small and flatly arched unbuttressed septum. Length 0·31, breadth 0·19, alt. 0·15 inch. This species is peculiarly long and narrow, and roomy within from its steep walls and blunt apex. Its sculpture too is very striking. (*Wats.*)

Off Culebra Island, West Indies, 390 fms.

Rimula granulata SEG. Pal. Malac. d. Terreni Terz. di Messina, Fissurellidi, p. 14, t. 5, f. 6.—*Puncturella* (*Cranopsis*) *granulata* WATSON, Challenger Gastrop., p. 46, t. 4, f. 5.

Originally described from the Miocene marls of Rometta, near Messina.

P. PROFUNDI Jeffreys. Pl. 27, figs. 73, 74.

Shell small, thin, roundly oval; the front slope is slightly convex, the others still more slightly concave; the top, of which merely the extreme tip is incurled, projects upwards and a little backwards in a point which is sharpened by the crater-like hole of the slit close in front; minute riblets closely beaded score the surface; the slit is large and round. Sculpture: There are very many radiating riblets which are sharp and distinct but very minute; the surface is also delicately fretted with fine concentric undulations, which in crossing the riblets rise into sharp little contiguous tubercles, but in the narrow intervals are almost invisible. Color frosted glassy-white. Apex fine, sharp, prominent, projecting upwards and backwards, with only the extreme tip (which is very small) incurled and slightly turned round; there are fully two whorls. Slit is a largish round hole with a pointed prolongation backwards; it lies close in front of the tip and cuts away the natural top of the shell. Margin excessively thin, patulous all around, not crimped. Inside glassy; a very small hollow runs into the apex; the lines of the outside ribs are just perceptible; there is no

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anterior furrow; the slit, as seen from within, is round and is very little interfered with by the short, thin, triangular, straight-edged, little-oblique septum. Length 0·21, breadth 0·16, alt. 0·14 inch. (*Wats.*)

It was with very great hesitation I united the Challenger specimens to this species; and in my paper to the Linnean Society (loc. cit.) I mentioned various points of distinction between the forms. Even there, however, I suggested that a fuller series of specimens than I had seen at the time I wrote might supply connecting links between them. This actually proved to be the case, so enabling me—though only at the very last moment and after my paper was in print—to suppress the name I had chosen for the species and to adopt that of the late Dr. Gwyn Jeffreys. (*Wats.*)

North Atlantic, 740–1750 fms.; *Off Culebra Island, West Indies*, 390 fms.

P. profundi JEFFR., Ann. Mag. N. H. ser. 4, xix, p. 232, 1877; P. Z. S. 1882, p. 675, t. 1, f. 10.—*P.* (*Cranopsis*) *profundi* WATS., Challenger Gastrop. p. 47.

Section *Fissurisepta* Seguenza, 1863.

Fissurisepta SEGUENZA, Pal. Malac. Terz. Messina, in Annali dell'Accademia degli Aspiranti Naturalisti, 3d series, vol. ii, 1862, p. 83 (1863). First species *F. papillosa* Seg., *l. c.*, p. 84, t. 4, fig. 2.

Fissurisepta is an erect, conical *Puncturella* in which the short oval fissure has wholly absorbed the apex. The internal septum is well developed; there is no radiating sculpture, the smoothness of the surface being broken only by tiny tubercles or granules, which are better developed in species of this section than in the more coarsely sculptured forms, although they are as a general rule, to be seen on all *Puncturella* species.

P. PAPILLOSA Seguenza. Pl. 64, figs. 16, 17, 18.

Shell ovate, small, elevated, conical, very thin; aperture horizontal, ovate; internal plate a little curved; surface outside ornamented with papillæ arranged in longitudinal lines.

Length 2·8, width 1·9, alt. 2 mill. (*Seg.*)

North Atlantic.

F. papillosa SEG. Ann. dell'Ac. Aspir. Nat. 1862, p. 84, t. 4, f. 2, 2a, 2b.—JEFFREYS, P. Z. S. 1882, p. 675.

Described as a Sicilian Miocene fossil.

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This species varies with respect to the size of the tubercles or papillæ. Some recent and fossil specimens have very few and slight scattered tubercles, or are nearly smooth. The recent are rather larger than the fossil specimens, and have usually stronger tubercles. (*Jeffreys.*)

P. ROSTRATA Seguenza. Pl. 25, fig. 25; pl. 64, figs. 30, 31.

Shell small, ovate, conic, much elevated, a little curved or subrostrate; apex subacute; aperture small, ovate; internal plate large, with two scarcely distinct lateral sulci outside corresponding to it. Surface ornamented with minute rounded granules. Length 5, breadth 3·5, alt. 4·6 mill. (*Seg.*)

Bay of Biscay; North Atlantic. Fossil in the Miocene ? and Pliocene of Sicily.

F. rostrata SEG., *l. c.* p. 84, t. 4, f. 3, 3a, 3b, 3c.—*Jeffreys*, P. Z. S. 1882, p. 675.

Seguenza's description and figures are given.

Var. TRIANGULATA Dall.

Shell very small, thin and high, ovate, with slightly impressed sides, glassy, dotted in regular oblique-curving lines, with high, blunt, minute, glassy tubercles; the side slopes are high and straight, the front edge faintly convex, the back slope slightly concave; there is no embryonic apex; and the slit is a round hole parallel to the base. Sculpture: The surface of the shell is glassy, but is dotted with minute tubercles which are generally parted by more than their own diameter and run in very regular oblique sweeps parallel to one another. Color transparently glassy, the tubercles being dead white. Apex none, the top being slightly bent back and the entire tip removed. Slit: A small round hole on the very top, with slightly irregular sides. Margin very thin; the sides are almost straight or a little bent in, and the breadth is very slightly greater behind than before. Inside quite glassy; there is no anterior furrow, and the straight concave-edged septum runs far down the shell parallel and very near to the posterior wall, thus cutting off a long sheath-like process. Length 0·13, breadth 0·08, alt. 0·12 inch. (*Wats.*)

Off Culebra Island, 390 fms.; *Off Campeche, Yucatan*, 200 fms.

P. (*Fissurisepta*) *rostrata* WATSON, Challenger Gastrop., p. 48.—*Fissurisepta triangulata* DALL, Blake Gastrop., p. 404.

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Numerous specimens of this little shell are before me. They seem to differ from the *F. rostrata* as described and figured by Seguenza, in having the apex rather more central and the minute tubercles arranged in "oblique sweeps" rather than in horizontal rows. The great variation of *rostrata* as shown in Seguenza's several excellent figures, and the fact that Dr. Dall quotes Watson's pl. 4, fig. 10 as an illustration of his *F. triangulata*, while the said figure is in fact a copy of one of Seguenza's illustrations of the typical form of his fossil, causes me to hesitate to separate the recent from the fossil forms.

P. GRANULOSA Jeffreys. Pl. 27, figs. 71, 72.

Shell roundish-oval, conical, but somewhat depressed except towards the apex, thin, opaque, and lusterless; sculpture, very numerous fine and delicate striæ which radiate from the apex or beak, and are closely covered with minute tubercles; some of these striæ do not quite extend to the apex, and are alternately larger and smaller; the apex is irregularly tubercled; margin finely crenated or notched by the striæ; foramen nearly circular; inside smooth, but not polished; septum triangular, covering about half only of the foramen on the underside. Length 0·125, breadth 0·1 inch. (*Jeffr.*)

In my paper on Norwegian Mollusca ('Annals and Magazine of Natural History' for June, 1869), I named this remarkable shell as *F. papillosa* of Seguenza; but I afterwards found that I was mistaken as to the species. The shell now described is more delicate, and the sculpture is much finer, with regular and close-set striæ which are studded with far more numerous and minute tubercles. The foramen is circular in the present species, and triangular in *F. papillosa*.

North Atlantic; Dröbak, Norway, 50 fms.

F. granulosa JEFFR. P. Z. S. 1882, p. 675, t. 50, f. 9.

Genus ZEIDORA A. Adams, 1860.

Zeidora A. AD., Ann. Mag. N. H. 1860, p. 301, type *Z. calceolina*.—AD. & SOWB., Thes. Conch. iii, p. 209.—SOWB. 2D, in Conch. Icon. vol. xix, 1873.—WATSON, Challenger Gastrop. p. 36.—*Zidora* FISCHER, Manuel, p. 861.—*Crepiemarginula* SEGUENZA, Formazione Terz. di Reggio-Calabria, p. 273, type *C. reticulata* Seg.= *Z. seguenzæ* Wats.

Shell oblong, depressed, the apex recurved, posterior; fissure an open slit in the front margin; interiorly provided with a plate or

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"deck" like *Crepidula*. Surface cancellated; front slope grooved by a slit-fasciole having elevated edges.

This little-known genus seems to stand between *Puncturella* and *Emarginula*.

Z. RETICULATA A. Adams. Pl. 64, figs. between 16 and 20.

Oblong, the back convex; decussated with elevated radiating lines and concentric lirulæ. Margin crenulated; fissure deep, narrow. This species differs from *Z. calceolina* in being more convex, less obtuse anteriorly, and in the fissure being narrow and deeply incised; the sculpture moreover is very different, being finely reticulated instead of widely cancellate. (*Ad.*) Length 4 mill.

Mino-Sima, Japan.

Z. reticulata A. AD., Thes. Conch. iii, p. 209, f. 1, 2.—SOWB. in Conch. Icon. xix, f. 1.

Z. CALCEOLINA A. Adams. Pl. 64, figs. 27.

Oblong, elegantly cancellated with elevated radiating and concentric lines; sides of the median furrow elevated; apex posterior, deflexed; edge of the septum acute, entire. Wider and more depressed than *Z. reticulata*, and the concentric and radiating lines form a much wider net-work. (*Ad.*) Length 4 mill.

Sts. of Corea, 16 miles from Mino-Sima, Japan, in 63 fms.

Z. calceolina AD. Ann. Mag. N. H. 1860, p. 302.—AD. & SOWB. Thes., p. 209, f. 3.—SOWB., Conch. Icon. xix, f. 2.

Type of the genus *Zeidora*.

Z. NAUFRAGA Watson. Pl. 27, figs. 55, 56, 57, 58.

Shell white, delicate, depressed, oblong, pointed behind, with a minute short apex, rounded and cleft in front, with a broad flat keel bearing the old cleft-scar and extending the whole length of the shell; the enormous mouth is closed behind by a crepidula-like partition. Sculpture: Longitudinals, from the apex to the cleft across the middle of the back runs a broad raised keel, flat on the top, where it is scored by the minute, delicate, sharp, prominent, close-set, but not contiguous scars of the old cleft; on either side it is bordered by a sharp marginal line: from these marginal lines branch off feeble irregular diverging threadlets between which, as they go wider apart, others arise; the intervals between them are two to three times the breadth of the threadlets. Spirals, strictly speaking, there are none, but the whole surface is scored at right

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angles to the longitudinals with a series of threadlets, very similar in form, but rather more closely set; these radiate from the apex and indicate the old mouth edges. Color porcellanous-white, which is dead on the threadlets but almost translucent elsewhere from the extreme thinness of the shell. Apex: at the posterior end of the shell there is a narrow, rounded, prominent beak, within which, a little bent to the right and projecting slightly above the margin of the mouth, is the minute apex of one whorl. Mouth oblong. Margin minutely denticulated by the ends of the ribs; cleft in front by a strong, parallel-sided, blunt-ended fissure; behind, it is peculiarly patulous, being markedly bent outwards from the line of attachment of the septum, this bending being strongly shown on the outside of the shell. Inside glossy, smooth; a strong depression corresponding to the exterior keel extends from end to end of the shell. Septum: A little way within the margin, and deepest at the end, is the short oblique septum, which is faintly arched, with a concave edge in front. Length 0·38, breadth 0·2, alt. 0·12 inch. (*Watson.*)

The present species, though somewhat chipped, is of great beauty. It differs from *Z. calceolina* which is rudely cancellated, and is also wider and more depressed. It is like *Z. reticulata*; but is larger and deeper, has the old cleft-scar raised on a projecting ridge which forms a strong internal furrow, has the beak sharper and more projecting, the form is more oblong and more pinched-in at the sides, the sculpture lines are much finer and less regular than in that species. (*Watson.*)

North of Culebra Id., West Indies, 390 fms.

Z. naufraga WATS, Journ. L. Soc. xvii, p. 27; Challenger Gastrop., p. 36, t. 4, f. 3.

✓Genus EMARGINULA Lamarck, 1801.

Emarginula LAM. Système des Anim. etc., p. 69; An. s. Vert. vi, p. 212.—*Semperia* CROSSE, Journ. de Conchyl. 1867, p. 74.

Shell oval, obliquely conical, the recurved apex directed backward; front slope with either a deep incision in the margin (*Emarginula* s. s.) or a closed hole (*Rimula*). A distinct anal fasciole extends upward from the fissure, sculptured differently from the other ribs of the surface; surface latticed; no septum or deck inside.

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Subgenus EMARGINULA s. str.

Fissure an open slit in the front margin.

Subgenus RIMULA Defr.

Fissure a closed hole on the front slope.

Subgenus EMARGINULA *s. s.*

As sections under *Emarginula* (*restricted*), I have placed two groups:

1. *Nesta* H. Ad., an elongated Emarginula with the recurved apex posterior and marginal, and

2. *Emarginella* Pils., proposed for a species of doubtful relationships, the soft parts of which are so voluminous as to be far larger than the shell.

Species of the Mediterranean, the Atlantic, and the Gulf of Mexico.

E. HUZARDI Payraudeau. Pl. 28, fig. 16.

Shell depressed, oblong-ovate, posterior slope straight, half the length of the convex front slope. Slit narrow, one-fifth to one-sixth the length of the shell. Surface latticed by alternately larger and smaller radiating riblets and delicate raised concentric laminæ, forming compressed scales on the ribs and cutting the interstices into pits.

There are 25–28 primary radiating riblets; the minute apex is distinctly recurved; the side margins are arched so that the shell rests upon the ends only. Inside bluish-white; a narrow callus extends from apex to slit, but there is no groove; margin finely denticulated. Length 11, breadth 7½, alt. 2½ mill.; length 13, breadth 8, alt. 4 mill.

Mediterranean and Adriatic Seas.

E. huzardii PAYR. Moll. de Corse, p. 92, t. 5, f. 1, 2, 1826.—DESH. Exped. Sci. Morée iii, p. 134.—PHILIPPI, Enum. Moll. Sicil. i, p. 115.—WEINKAUFF, Conch. des Mittelm. ii, p. 398.—SOWB. in Conch. Icon., t. 1, f. 4.—BUQ. DAUTZ. & DOLLF. Moll. Rouss., p. 449, t. 54, f 7, 8.—? *Patella scissa* VON SALIS Reise ins Koen. Neap., p. 359, t. 6, f. 1.—*E. cusmichiana* BRUS., Contr. pella Fauna Dalm., pp. 38, 81.—*E. fissurelloides* NARDO mss., *teste* Monterosato.—*E. depressa* RISSO, Eur. Mérid., t. 10, f. 151, not *E. depressa* Blainville.

More depressed than its allies, and having the apex nearer the middle.

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E. ELONGATA Costa. Pl. 64, figs. 12, 13.

Shell small, elliptical, its altitude contained 2½ times in its length; front slope strongly arched, back slope short, steep, straight, less than one-fourth as long as the front slope. Apex strongly recurved, near the posterior end. Sculpture consisting of a lattice-work composed of strong, subequal or alternately smaller radiating ribs crossed by elevated concentric threads; radiating riblets 32–36 in number about 20 of them reaching to the apex. Interstices and pits between the ribs having regularly placed microscopic white dots of an elongated form, about 6 of them in each pit.

Inside white, with opaque white dots showing through. No callus in front, but a slight sulcus ending in the narrow slit in front, the latter a little less than one-fourth the length of the shell.

Length 9, breadth 6, alt. 3½ mill.

Mediterranean and Adriatic Seas; Atlantic Ocean at the Canaries, etc.

E. elongata COSTA, Oss. Zool. Is. Pantelleria, p. 10, no. 17, 1829.—PHIL. Enum. i, p. 115, t. 7, f. 13.—BUQ., DAUTZ., & DOLLF., Moll. du Rouss. p. 451, t. 54, f. 9–12.

A white, semitransparent little shell, more elevated than *E. huzardi*, more depressed than *cancellata*, *fissura* or *solidula*. The ribs are comparatively few, and the lattice-work coarse.

E. COMPRESSA Cantraine.

I have not access to the description and figures of this species. Jeffreys say that it differs from *E. papillosa* in being more compressed at the sides, and is shorter or has a rounded and more globular outline; it is readily distinguishable from *E. elongata* by the shape and much finer sculpture. The distribution given by Dall is:

Off Portugal; Georgia, Florida Strait to Barbados, 84–630 fms.

E. compressa CANTRAINE, Diagn. esp. nouv. Moll. (Bull. de l'Acad. roy. Brux. ix, 12, 1835), p. 22.—JEFFREYS, P. Z. S. 1882, p. 679.—DALL, 'Blake' Gastrop., p. 406; Catal. Mar. Moll. S.-E. U. S., p. 170.—*E. tuberculosa* LIBASSI, Mem. Conch. foss. Palermo (Atti, iii, 1859), p. 15, f. 1.

E. PAPILLOSA Risso. Pl. 64, fig. 1.

Shell sculptured with unequal, alternately wide and narrow radiating papillose ribs; interstices ornamented with delicate scales; apex subdepressed; epidermis gray. Length 12 mill. (*Risso.*)

Mediterranean and Adriatic Seas, 10–40 fms.; *Atlantic, off W. Europe.*

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E. papillosa Risso, Hist. Nat. de l'Eur. Mérid. 1826, iv, p. 260, f. 147.—Jeffreys, P. Z. S. 1882, p. 679.—*E. Adriatica* Costa, *teste* Jeffr.

E. CANCELLATA Philippi. Pl. 28, fig. 35.

Shell ovate, conical, front slope convex, posterior slope straight, about half the length of the shell; apex recurved, situated half-way between the center and the posterior end. Sculptured with close radiating ribs alternately larger and smaller, the interstices very closely latticed; radiating ribs 62–68 in all. Inside white; a white callus extending downward to the narrow fissure in front; this slit is about one-fourth as long as the shell. The anal fasciole has rather distant arched lamellæ. Color white or yellowish.

Length 12–13, width 9–10, alt. 7–8 mill.

Mediterranean and Adriatic Seas; Atlantic Ocean at Madeira, Channel Is., 8–250 fms.; *Gulf of Mexico, off Havana and Barbados*, 100–127 fms.

E. cancellata Phil. Enum. Moll. Sicil. i, p. 114, t. 7, f. 15.—and of Weinkauff, Jeffreys, Sowerby, Buquoy, Dautzenberg & Dollfuss, (Moll. du Roussillon, p. 452) *et al.*—*E. sicula* Gray, Pot. & Mich. Galerie, i, p. 518, t. 36, f. 11, 12, (*? ? E. sicula* Gray).—*E. fissura* Payr. *et al.*, not of Linné.—*E. reticulata* Risso, not of Sowerby.—*? ? E. conica* Blainv. Malac., t. 48, f. 4.

It is larger, more elevated than *E. elongata*, and has many more riblets. It is less elevated than *E. fissura* (*reticulata* Auct.), and has more ribs and finer concentric bars in the interstices than that species. Dall says that the American specimens are a little more elegant in sculpture than the European, but may fairly be referred to the same species ('Blake' Gastrop., p. 406.)

N. sp.

E. MAGNIFICA Pilsbry. Pl. 64, figs. 5, 6.

Shell large, elevated, anterior slope convex, posterior slope concave above, then straight; apex recurved, situated at the posterior fourth of the shell's length. Sculpture consisting of very numerous and close, unequal, narrow radiating riblets, crossed by rather thick, somewhat irregular concentric threads, cutting the interstices into pits and forming rounded nodes upon the radii. The slit is one-fifth the length of the shell; slit-fasciole distinct, finely sculptured with close arcuate transverse lamellæ. Inside there is a rather strong callus along the edges of the slit and extending up-

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ward, somewhat grooved in the middle. Border of shell thin, finely crenulated.

Length 20½, breadth 15½, alt. 8¾ mill.; length of slit 4, breadth ¾ mill.

Length 15, breadth 10¾, alt. 6½ mill.; length of slit 3 mill..

St. Croix, West Indies.

Two specimens of this exquisitely sculptured species are before me, agreeing in all respects except size. The color is dull whitish. It differs from *E. cancellata* Phil. in having the concentric threads as prominent where they pass over the radii as in the interstices, the radiating riblets less unequal in size and more than twice as numerous, the cone more slender and graceful and the anal fasciole more closely cross-striate.

E. MULTISTRIATA Jeffreys. Pl. 25, figs. 29, 30.

Shell helmet-shaped, somewhat compressed at the sides, rather thin, lusterless, and opaque; sculpture, numerous slight ribs, which radiate from the beak or apex to the front margin on every side; usually, but not regularly, a smaller alternates with a larger rib; the crests are studded with rather distant tubercles, giving a prickly appearance; the intervals between the ribs are filled with minute and close-set transverse striæ; colour whitish; margins slightly notched by the termination of the ribs; beak small, incurved, placed perpendicularly to the front margin, slit short, but broadish; the fissural furrow is filled up with crowded arched septa or plates; inside glossy, showing the impression of the external sculpture.

Length 0·5, breadth 0·3. (*Jeffr.*).

Mediterranean and Atlantic, off W. coast Spain, 217–374 fms.

E. multistriata JEFFR.. Ann. Mag. N. H. 1882, p. 30; P. Z. S. 1882, p. 680, t. 50, f. 12.

This differs from *E. cancellata* Ph., in being proportionally higher, narrow or compressed at the sides, and thinner; the beak overhanging the front margin; the ribs are slighter and more numerous, and the intermediate striæ twice as many. It is also distinct from *E. tuberculosa* Libassi, and *E. confusa* Seg., in sculpture and other respects.

E. FISSURA Linné. Pl. 25, figs. 17, 18, 19, 20; pl. 29, figs. 25, 26, 27.

Shell usually raised, so as to give a height in proportion to the length as 2 to 3, solid, opaque, not glossy; sculpture, 25–35 strong but narrow and cord-like ribs, which radiate from the beak to the

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margin, and as many smaller intermediate ones; sometimes these ribs are equal in size; they are crossed by from 20 to 30 somewhat slighter concentric ribs, imparting a regularly and deeply cancellated or punctured appearance, and forming slight nodules at the point of junction; the surface is also covered with microscopical and close-set longitudinal striæ, and in the young may be observed the same white dots that have been been described with reference to Puncturella noachina; color white, often more or less stained by extraneous matter; beak very small, ribless, incurved and slightly twisted to the left, forming a spire of two whorls; slit of equal width, extending from the margin in front about one-third of the way up, where it is closed by a subsequent formation of shell, and becomes as far as the crown a rather deep groove, which is somewhat closely laminated across; mouth roundish-oval, distinctly scalloped and notched by the indentation of the longitudinal ribs; inside nacreous, finely lineated in a concentric direction, and usually exhibiting the external larger ribs; the sides of the slit are thickened, and the outside groove is represented by a white ridge. (*Jeffr.*)

Length 9, breadth 7½, alt. 6 mill.

North-east Atlantic, from Finmark and Faroe Is. to the Canaries.

Patella fissura Linn. Syst. Nat. xii, p. 1261.—*E. fissura* Jeffreys Brit. Conch. iii, p. 259, t. 59, f. 2.—*E. reticulata* J. Sowerby, Min. Conch., t. 33, lower figs.—Forbes & Hanley, Hist. Brit. Moll. ii, p. 477.—Sow. 2d. Thes., p. 214, f. 37, 38.—*E. conica* Sars, not Schum.—*E. mülleri* Forbes & Hanley Hist. Brit. Moll., plates, t. 63, f. 1.—*E. lævis, E. fissurata, E. tenuis* Recluz, Rev. Zool. 1843, p. 232.—*E. emendata* Sowb. Thes., p. 215, f. 11.—*Semperia paivana* Crosse, Journ. de Conchyl. 1867, p. 76, teste Watson.

E. fissura is generally rather straightly conical, the apex not much behind the middle and never extending over the hind margin of the shell. It is more elevated than any of the preceding species.

Var. 1. subdepressa. Somewhat larger, more depressed, and expanded at the sides. (*Jeffr.*)

Var. 2. elata. Also larger than usual, much higher, and more solid. (*Jeffr.*)

Var. 3. incurva. Smaller, more raised, and compressed at the sides, with the beak almost overhanging the posterior margin; sometimes of a pinkish color inside. (*Jeffr.*)

The edges of the fissure are sometimes in contact at the edge, giving rise to the form described by Sowerby as *E. emendata* (pl. 28, fig. 14), and by Crosse as *Semperia paivana*.

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E. ROSEA Bell.

Small, elevated-conical, the apex hooked a little over the posterior margin; altitude of shell less than the length of the mouth or base.

Shell smaller and much narrower than *E. fissura*, and otherwise distinguishable in the following particulars: it is proportionately broader in front than behind, and pinched up at the sides; the front is more arched or convex, and the back more concave; the longitudinal ribs are more closely set, and mostly equal-sized; the cancellation is smaller, and exhibits round holes instead of square lattice-work; the color is often pinkish; the beak quite overhangs the back margin in full-grown specimens, and it is invariably longer, and greatly incurved; the slit is much shorter; the mouth is smaller; and the inside is frequently reddish-brown and the cancelli are marked by white spots. (*Jeffr.*)

Length 5½, breadth 4, alt. 4 mill.

Southern England; Ocean Coast of France.

E. rosea BELL, Zool. Journ. i, p. 52, t. 4, f. 1.—FORBES & HANLEY, Hist. Brit. Moll. ii, p. 479, t. 63, f. 3.—JEFFREYS, Brit. Conch. iii, p. 261, t. 59, f. 3.

It is less hooked than the following, the mouth larger. In fact, *E. rosea* is an intermediate between *E. fissura* and *E. conica*.

E. CONICA Schumacher. Pl. 28, fig. 19.

Small, elevated, the apex very strongly hooked over the posterior margin; coarsely latticed; altitude about equal to the length of the aperture or base.

Surface rather coarsely latticed; radiating ribs subequal in front, alternating at the sides, about 25 to 32 in number, crossed by concentric cords about as far apart as the riblets, cutting the interstices into pits and forming narrow nodes on the ribs. Aperture oval, margin strongly crenulated; slit very narrow, about one-third as long as the aperture; slit-fasciole a narrow, deep groove. Color yellowish. Length of aperture 4, breadth 3½; total alt. 3¾–4 mill.

Mediterranean and Adriatic Seas.

E. conica SCHUM., Syst. Vers. Test. p. 181, 1817 (founded on Martini's figures, Conchyl. Cab. i, f. 109, 110.)—*E. pileolus* MICHAUD, Bull. Linn. Soc. Bord. iii, 1829, p. 171, f. 23, 24.—*E. capuliformis* PHIL., Enum. Moll. Sicil. i, p. 116, t. 7, f. 12.—*E. costæ* TIBERI, Journ. de Conchyl. vi, p. 38, t. 2, f. 5, 1857.—*E. curvirostris* DESH., Expéd. Sci. de Morée, iii, 2d pt., p. 134.

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Smaller, more elevated and more recurved than *E. rosea*. Numerous specimens of this form before me show no transition into the form called *rosea*. I am therefore inclined to consider the Mediterranean and Atlantic shells specifically distinct. There can be no doubt that this is the *E. conica* of Schumacher, no other species at all resembling it.

E. SOLIDULA Costa. Pl. 64, figs. 9, 10, 11.

Small, conical, apex shortly recurved, situated at the posterior sixth of the length; front slope convex, back slope subconcave, equalling half the width of the shell. Radiating riblets numerous (about 50), subequal, fine; concentric raised striæ very fine and very close, minutely crenulating the riblets. Fissure narrow, about one-fourth as long as the shell. Color yellowish-white.

Length 6½, breadth 5, alt. 3¾ mill.

Mediterranean Sea.

E. solidula COSTA, Oss. Zool. Sull'Isola di Pantellaria, p. 10, no. 18.—PHILIPPI, Enum. i, p. 115, t. 7, f. 14.

Smaller, with much finer concentric sculpture than *E. fissura;* far smaller than *cancellata*, more erect, with more numerous, *equal* riblets. The apex is much less recurved and the sculpture finer than in *E. elongata*. Originally described as a fossil. Recent specimens from the coast of Sicily are before me.

E. CRASSA J. Sowerby. Pl. 27, figs. 59, 62, 63, 64, 65.

Shell usually more depressed than that of either of the two former species, moderately solid, opaque, slightly glossy; sculpture, 40–50 broad and compressed longitudinal ribs (each of which is sometimes divided into three) with as many smaller intermediate ones; all these ribs are crossed by fine, equally numerous and wavy concentric striæ or wrinkles, producing a delicately granulated appearance; the surface is likewise covered with minute white glistening dots arranged in longitudinal rows; color white; beak small and somewhat angular, usually less excentric than in the other species; it is twisted a little to the left, and forms a spire of between one and two whorls. Slit rather narrower above than below, extending (in adult specimens) from the middle of the front margin between one-fourth and one-fifth of the way up, being closed in the line of its previous passage, and becoming a rather broad and shallow groove which is closely laminated transversely; mouth varying in shape from oval to roundish-oval, delicately scalloped and

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notched by the impression of the ribs; inside porcelain-white and nacreous, exquisitely and closely but irregularly lineated in a concentric direction; the edges of the slit and groove are thickened. (*Jeffr.*) Length 28, breadth 20 mill., or less.

West coast of Scotland; Ireland; off the Scandinavian coast.

E. crassa J. Sowb., Min. Conch. p. 73, t. 33, upper figs.—Forbes & Hanley, Hist. Brit. Moll. ii, p. 481, t. 63, f. 2; t. 200, f. 2.—Jeffreys, Brit. Conch. iii, p. 263, t. 59, f. 4.

The young differs from *E. fissura* of the same size in being more depressed, and in its peculiar sculpture. In that species the ribs are strong, and the surface is coarsely cancellated; in this the ribs are fine and more numerous, and the surface is delicately granulated. The rows of small white dots are always visible in *E. crassa*; and the slit is shorter relatively to the size of the shell. (*Jeffr.*)

* * *

Indo-Pacific species.

Group of E. puncticulata.

Shell rather elevated, unicolored whitish or yellowish; apex posterior; surface finely ribbed and latticed.

E. fenestrella Deshayes. Pl. 41, figs. 44, 45, 46.

Shell ovate-oblong, narrow, white, rather thick, very inequilateral, ornamented with numerous radiating riblets; having flat, regular transverse striæ, the intervals excavated into circular pits. Middle rib broad, excavated, ornamented with numerous appressed, arched scales. Apex acute, much inclined backward. Fissure short, wide; margin crenulated. Length 10, breadth 7, alt. 4 mill. (*Dh.*)

Island of Réunion.

E. fenestrella Dh. Moll. Réunion, p. 49, t. 7, f. 12–15.

The surface has 24 radiating ribs.

E. bicancellata Montrouzier. Pl. 64, fig. 42.

Shell elongated oval, summit acute, salient, recurved backward and situated at the posterior fourth of the shell's length. Front slope very convex, back slope straight; yellowish-white. Sculptured with 15–17 strong ribs, rendered very perceptibly nodulose by by the intersection of concentric less salient ribs; the decussation resulting in a strong latticing of the whole surface. Toward the margins the number of ribs is doubled by the intercalation of smaller

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secondary riblets between the principal ribs. Independent of the coarse sculpture a marking of very fine longitudinal and transverse ridges becomes visible under a lens. The anterior rib terminates in a long slit, about one-third the length of the shell. Slit-fasciole narrow, crossed by a series of very regular little imbricating lamellæ. Edge denticulated. Length 8, width 6 mill.

Island of Art, New Caledonian Archipelago.

E. bicancellata MONTR., Journ. de Conchyl. 1860, p. 112, t. 2, f. 9.

Somewhat allied to *E. fenestrella* Dh. The above is taken from Montrouzier's excellent description.

E. MICANS A. Adams. Pl. 64, fig. 15.

Elongate-oval, pale brown, shining, vertex declining backward; regularly cancellated with radiating riblets and elevated transverse lines; pits square; margin of aperture denticulated, incision long and large. Scarcely differing from *E. elongata*, which also has the interstices deep and shining, except in being a much more conical shell. (*Ad.*)

Raines' Island, N. Australia.

E. micans AD., P. Z. S. 1851, p. 84, no. 18.—SOWB., Thes. p. 212, f. 60.

E. CONCINNA A. Adams. Pl. 28, figs. 5, 6.

Ovate-depressed, whitish, vertex posterior, declining toward the margin; having about 12 distinct, radiating sulcose ribs, interstices finely decussated with longitudinal and transverse lines; margin of the aperture denticulated, deeply incised in front. (*Ad.*)

Habitat unknown.

E. concinna AD., P. Z. S. 1851, p. 55, no. 25.—SOWB. Thes. p. 212, f. 34, 39, 60; Conch. Icon. f. 13.

This may be a synonym of *E. decussata* Phil. or *E. elongata* Costa.

E. BELLULA A. Adams. Pl. 28, fig. 37.

Elongate-elliptical subdepressed, whitish, vertex subposterior, declining; closely sculptured with distant, prominent ribs and transverse lines; carina punctured above the slit; margin of aperture denticulate, sulcate within, deeply incised in front. The sculpture is sharp, almost aculeated, and the cicatrix above the notch is elevated into a prominent keel, pitted between two ridges. (*Ad.*)

Catanuan, Province of Toyabos, Luzon, Philippines, 10 fms.

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E. bellula AD., P. Z. S. 1851, p. 86, no. 31.—SOWB., Thes., p. 213, f. 55, 56; Conch. Icon., f. 36.

E. CANDIDA A. Adams. Pl. 28, fig. 36.

Elliptical, depressed-conic, oblique, white; vertex subposterior, inclined backward; with alternately larger and smaller scaly radiating riblets, interstices latticed; margin of the aperture denticulate, deeply incised in front. Differing from *E. bellula* in being more depressed, and more coarsely and obtusely sculptured. (*Ad.*)

Port Adelaide, Australia.

E. candida AD., P. Z. S. 1851, p. 85, no. 30.—SOWB., Thes., p. 213, f. 45, 46.

E. VIMINEA A. Adams. Pl. 28, fig. 13.

Ovate-conic, whitish, vertex central, inclined backward, regularly cancellated with radiating, nodulous, subequal ribs and thick transverse lines; pits deep, punctiform; margin of aperture crenated, deeply incised in front. (*Ad.*)

Philippine Is.

E. viminea AD., P. Z. S. 1851, p. 85, no. 26.—SOWB., Thes. p. 213, f. 12, 13; Conch. Icon. f. 14.

E. CUCULLATA A. Adams. Pl. 28, fig. 2.

Oboval, obliquely conical, white, vertex produced, subposterior, incurved; radiating ribs prominent, nodulous; interstices cancellated; sides of the aperture narrowed in front, margin denticulate, rounded behind; profoundly fissured in front, fissure long and wide. Very elevated, narrowest in front, with some prominent distant ribs posteriorly. (*Ad.*)

Singapore, on shells, 7 fms.

E. cucullata AD., P. Z. S. 1851, p. 86, no. 35.—SOWB., Thes. p. 213, f. 19, 20; Conch. Icon. f. 28.

E. LONGIFISSA Sowerby. Pl. 28, fig. 25.

Subdepressed-conic, all over most minutely cancellated, apex elevated, a little behind the middle; ribs about 16, large, alternating with smaller ones; fissure profound, slit-fasciole profound, continuing to apex. Of a light buff color, very minutely cancellated. (*Sowb.*)

Habitat unknown.

E. longifissa SOWB., Thes., p. 213, f. 62; Conch. Icon., f. 52.

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E. STRIATULA Quoy. Pl. 64, fig. 2.

Shell ovate-conic, fragile, granulose, very delicately ribbed longitudinally and transversely; vertex oblique, recurved; margin crenulated; slit deeply excavated.

Length 10, breadth 7, alt. 7 mill. (*Q.*)

New Zealand.

E. striatula Q. & G. Zool. Astrol. iii, p. 332, t. 68, f. 21, 22.—Not *E. striatula* of Sowerby, Thes. Conch., f. 59, and Conch. Icon., f. 47.

I do not know what the *E. striatula* of Sowerby may be, but it is certainly not Quoy's species.

E. CAPULOIDEA Nevill. Pl. 41, fig. 39.

Shell small, regularly ovate, capuloid, thin, pellucid; apex posterior, arcuately incurved; surface marked with very many acute, equidistant riblets alternating with more delicate ones; interspaces rudely and deeply pitted; margin of the aperture deeply crenated; fissure central in front, narrow and moderately incised; pallial impression rounded behind, deeply insinuated laterally at the apex, prolonged and gradually wider in front, truncate at its termination. Length 5½, breadth 4, alt. 3 mill. (*Nev.*)

Southern province of Ceylon.

E. capuloidea G. & H. NEVILL, Journ. Asiat. Soc. Beng. xxxviii, p. 161, t. 17, f. 16, 1869.

The most nearly allied species to the above is *E. crassicostata* Sowb.; it is however much smaller, more elevated, not narrowed anteriorly, and the sculpture is somewhat different. (*Nevill.*)

E. CRASSICOSTATA Sowerby. Pl. 29, figs. 30, 31, 32.

Oval, somewhat narrowed in front, with close, thick, noduliferous radiating ribs, the interstices clathrate; apex posterior; back arched; cicatrix above the suture carinated, foveolate. Oval, arched, with thick, rather close beaded ribs, the apex very posterior. (*Sowb.*)

Habitat unknown.

E. crassicostata SOWB. Thes., p. 214, f. 41, 42.

E. RETECOSA A. Adams. Pl. 28, fig. 34.

Shell elevated-conical, elliptical, whitish, vertex subcentral, inclined backward; ornamented with equal, subnodose radiating

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ribs; interstices regularly cancellated, the pits arranged in single series; margin of the aperture crenulated, slit profound. (*Ad.*)

Bolinao, province of Tambalas, Luzon, Philippines, 10 fms.

E. retecosa AD. P. Z. S. 1851, p. 86, no. 32.—*E. reticosa* SOWB. (as synonym of *E. reticulata*), Thes., p. 214, f. 49.

E. ADAMSIANA Sowerby. Pl. 28, fig. 32.

Subroseous, elliptical, cancellated with large rugose radiating ribs with smaller intermediate ones, and inequal liræ, all minutely scaly. Back arcuate, apex recurving back of the posterior margin. This species is more coarsely ribbed than *E. rosea*, and the surface of the ribs is minutely cancellated. (*Sowb.*)

Japan.

E. adamsiana SOWB., Thes. p. 214, f. 27, 28.

E. GALERICULATA A. Adams. Pl. 28, fig. 20.

Obliquely conical, capuliform, vertex strongly curved, projecting over the posterior margin; closely clathrate with narrow, crenulated radiating riblets, with transverse elevated lines in the interstices; front rib granulate-punctate above the slit; margin of the aperture crenulated, deeply incised in front. (*Ad.*)

Calapan, Id. of Mindoro, Philippines, 12 fms.

E. galericulata AD., P. Z. S. 1851, p. 84, no. 23.—SOWB., Thes. p. 215, f. 24.

E. EXCURVATA A. Adams. Pl. 28, fig. 29.

Shell elongate-elliptical, depressed-conic, testaceous; apex acute, subposterior, inclined backward; cancellated with radiating ribs and elevated concentric liræ; liræ nodulous at the ribs; base arcuate; margin of the aperture excurved, crenulated, deeply incised in front. (*Ad.*)

Habitat unknown.

E. excurvata AD. P. Z. S. 1851, p. 85, no. 27.—SOWB., Thes. (as synonym of *E. puncticulata*), p. 215, f. 35.

E. TENUICOSTATA Sowerby. Pl. 28, fig. 21.

Elliptical, elevated-conic, concentrically subfasciate with green; cancellated with numerous noduliferous ribs and minute concentric striæ; fissure profound; cicatrix behind the slit, foveolate. This species resembles *E. puncticulata* but is much more finely sculptured;

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it is also less expanded posteriorly than either *puncticulata* or *crassa*. (*Sowb.*)

Habitat unknown.

E. tenuicostata SOWB. Thes., p. 215, f. 17, 18.

E. SCUTELLATA Deshayes. Pl. 41, figs. 14, 15.

Shell ovate, depressed, subsymmetrical, apex subcentral, recurved; ornamented with numerous radiating riblets, of which seven are larger; median rib in front with elevated edges, and numerous equidistant scales. Marginal slit short, narrow; margin irregularly crenulated; inside concave, whitish ashen.

Length 20, width 15, alt. 7 mill. (*Dh.*)

Island of Réunion.

E. scutellata DH. Catal. Moll. de l'Ile de la Réunion, p. 45, t. 7, f. 1, 2.—? *E. planutarum* DUFO, Ann. Sci. Nat. (2), xiv, p. 205, 1840.—MARTENS in Möbius' Reis. n. Maurit. p. 298.

The form is like *Subemarginula*, but the distinct slit-fasciole places the species in *Emarginula* proper.

E. COSTULATA Deshayes. Pl. 41, figs. 12, 13.

Shell small, convex, ovate-oblong, apex excentric, acuminate, much inclined backward; regularly costellate, riblets narrow, the larger ones irregularly and very densely granulose; transverse liræ unequally cancellated; margin obtuse, regularly crenulated; anterior fissure narrow, deep. Length 7, width 5, alt. 3 mill. (*Dh.*)

Island of Réunion.

E. costulata DH. Moll. Réun., p. 47, t. 7, f. 3–5.

The slit is about one-fifth the length of the shell. The edge of the shell is quite thick. Color a uniform grayish-white inside and out.

E. DECORATA Deshayes. Pl. 41, figs. 16, 17.

Shell small, white, limpet-shaped, very unequally convex, longitudinally ribbed, riblets narrow, interstices with erect lamellæ; summit excentric, much inclined backward; slit short, narrow; margin thin, regularly dentate.

Length 6, width 4, alt. 2 mill. (*Dh.*)

Island of Réunion.

E. decorata DH. Moll. Réunion, p. 47, t. 7, f. 6–8.

The apex is situated at the posterior fifth of the length; fissure one-eighth the length of the shell.

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E. SPINOSA Deshayes. Pl. 41, figs. 20, 21.

Shell small, regularly oval, very inequilateral; elegantly decussated with numerous, regular, longitudinal and transverse riblets irregularly roughened with sparse spines; central riblet larger than the others, ornamented with numerous equal scales; apex strongly inclined backward, acute. Length 4, breadth 3, alt. 2 mill. (*Dh.*)

Island of Réunion.

E. spinosa DH., Moll. Réunion p. 48, t. 7, f. 9–11.

Fissure long narrow, one-sixth the length of the shell; the margin is finely crenulated; shell thin, fragile, semitransparent, of a very pale violet color.

E. PUNCTICULATA A. Adams. Pl. 28, fig. 30.

Shell oval, conical, the apex recurved, situated at the posterior seventh or eighth of the length. Sculpture consisting of about 28 principal radiating ribs, *each interval bearing three smaller riblets*, the middle one largest; interstices cut into pits by fine concentric raised threads, which only slightly crenulate the riblets. Slit long, nearly one-third the length of the shell; slit-fasciole distinct, festooned across by raised lamellæ. Color light yellowish. Interior white; a grooved callus extends upward from the slit inside.

Length 16, breadth 12, alt. 7 mill.

Calapan, Id. of Mindoro, Philippines.

E. puncticulata AD. P. Z. S. 1851, p. 84.—SOWB. Thes., p. 215, f. 14.

The large size, long fissure and the arrangement of the riblets described (most obvious on the posterior slope), are characteristic features.

Group of E. maculata.

Species variegated with dark spots or blotches or of a uniform dark color.

E. SOUVERBIANA Pilsbry. Pl. 64, figs. 28.

Shell ovate-suboblong, elevated-conical, apex prominent, exserted, posteriorly incurved, front slope long, convex, back slope shorter, straight-subconcave, obliquely descending at an angle of about 45°. Clathratulate with numerous radiating riblets with smaller ones intercalated, and elevated concentric lines; dull yellowish-white, marked with rather numerous dark blackish-green spots. Inside

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shining, showing the spots through; margin very minutely crenulated. Fissure narrow, subelongate, equalling two-fifths the distance from front margin to summit. Length 6½, breadth 4½, alt. 2¾ mill. (*Souv.*)

Island of Art, New Caledonia.

E. maculata SOUV., Journ. de Conchyl. 1872, p. 55, t. 1, f. 6.

The name is preoccupied by A. Adams for a Japanese species.

E. MACULATA A. Adams. Pl. 28, fig. 4.

Depressed-conic, capuliform, white, spotted with brown, having radiating nodulous riblets; vertex posteriorly inclined; aperture oval, margin crenulated, deeply fissured in front, fissure long, narrow. A very pretty cup-shaped species, mottled with pale brown, and with the radiating ribs distinctly nodulous. (*Ad.*)

Gotto Is., Japan.

E. maculata AD. in Thes. Conch. iii, p. 214, f. 31, 32.

E. PUNCTATA A. Adams. Pl. 28, fig. 33.

Ovate-conic, whitish-gray, beautifully punctate with green; vertex subcentral, inclined backward; longitudinal ribs alternately larger and smaller, beautifully granulated; margin of the aperture crenulated, excurved, deeply fissured in front. (*Ad.*)

San Nicholas, Id. of Zebu, Philippines, at low water.

E. punctata AD. P. Z. S. 1851, p. 84, no. 19.—SOWB. Thes., p. 215, f. 29, 30.

E. VARIEGATA A. Adams. Pl. 28, fig. 12.

Depressed-conic, white variegated with gray; apex obtuse, subcentral; numerous rugose, unequal, acute, radiating ribs; margin denticulate. (*Ad.*)

Camaguan, Philippines, on rocks at low water.

E. variegata AD., P. Z. S. 1851, p. 84, no. 20.—SOWB., Thes. p. 215, f. 9, 10.

E. FULIGINEA A. Adams. Pl. 28, fig. 3.

Elliptical, much depressed, fuligineous, apex subcentral, inclined backward; ornamented with close, equal, granulose radiating riblets and concentric incremental lines; aperture oval, green inside; margin crenulated, fissured in front, the fissure produced into a canal inside. (*Ad.*)

E. fuliginea AD., P. Z. S. 1851, p. 84, no. 22.—SOWB., Thes. p. 216, f. 7, 8.

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E. JAPONICA Sowerby. Pl. 28, fig. 18.

Sub-purple, subelliptical, conical, narrower behind, sides compressed, apex obtuse; fissure small; ribs unequal, rugose; posterior margin thickened within. Distinguished by a compression of the sides, the narrowness of the posterior end, and the thickening of the inner posterior edge. (*Sowb.*)

Japan.

E. japonica SOWB. Thes., p. 216, f. 43, 44.

E. FISSURATA Chemnitz. Pl. 29, figs. 28, 29.

Depressed-conical, wide, red, solid; apex obtuse, median; radiating ribs numerous, minutely nodulous, interstices smooth; fissure small, a callus extending upward from it inside. (*Sowb.*)

Philippines.

Patella fissurata CHEMNITZ, Syst. Conchyl. Cab. xi, p. 188, t. 197, f. 1929, 1930.—*Emarginula fissurata* AD. P. Z. S. 1851, p. 82.—SOWB. Thes., p. 216, f. 104.—*E. rubra* LAMARCK.

Group of E. incisura.

Shell depressed; apex nearer to the center than to the posterior end; basal side-margins arched, so that the ends alone support it.

Besides the following species, *E. huzardi* of the Mediterranean belongs here.

E. THOMASI Crosse. Pl. 21, fig. 26.

Shell ovate, slightly convex, compressed, narrower in front, rounded behind, very elegantly decussated with numerous longitudinal subequal riblets and subflexuous concentric lines; pale green; apex central, obtuse; fissure very broad; slit-fasciole having the edges elevated, crossed by transverse lamellæ; interior green, pale brown in the middle; margin crenulated. Length 22½, breadth 16, alt. 6 mill.; Length of fissure 5, width 2 mill. (*Crosse.*)

Aden, entrance to the Red Sea.

E. thomasi CROSSE, Journ. de Conchyl. 1864, p. 43, 152, t. 7, f. 1.

A remarkably large and depressed species, unlike any other.

E. PLANULATA A. Adams. Pl. 28, fig. 15.

Elongate-oval, complanate, summit subcentral, inclining backward; whitish; decussated with equal imbricately-roughened radiating riblets and concentric lines of increment; base arcuate; margin of the aperture deeply incised in front, the slit broad and deep.

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Anterior not so short as in *E. incisura*, the slit shorter and more abrupt. (*Ad.*)

Singapore, 7 fms.

E. planulata AD., P. Z. S. 1851, p. 86, no. 34.—SOWB. Thes., p. 211, f. 1; Conch. Icon., f. 20.

E. INCISURA A. Adams. Pl. 28, fig. 1.

Elongate-oval, planulate, pale, tawny, summit in front of the middle, inclined backward; decussated with unequal, scaly-roughened radiating riblets and elevated concentric lines; base arcuate. Margin of aperture crenulated; deeply fissured; fissure long; margins calloused within. In this species the slit is long, and a half-cut continuation of it extends to the apex. (*Ad.*)

Habitat unknown.

E. incisura AD., P. Z. S. 1851, p. 84, no. 17.—SOWB., Thes., p. 211, f. 2; Conch. Icon., f. 18.

E. CLYPEUS A. Adams. Pl. 28, fig. 7.

Elongate-elliptical, much depressed, testaceous, a buff spot in the middle of the back; summit subcentral, inclined backward; ornamented with close, equal, radiating, scaly-roughened ribs. Base arcuate, margin of the aperture crenulated, deeply fissured in front; the fissure large; aperture two-spotted inside. Narrow, scabrous, and has some prominent ribs. (*Ad.*)

Island of Burias, Philippines, 7 fms., on dead shells.

E. clypeus AD., P. Z. S. 1851, p. 83, no. 14.—SOWB., Thes. p. 211, f. 3; Conch. Icon. f. 21.

E. DILECTA A. Adams. Pl. 28, fig. 17.

Elongate-oval, subquadrangular, white, much depressed, summit subposterior, declining backward; decussated with subdistant, radiating, asperulate ribs, and elevated concentric liræ; base arcuate; margin of aperture denticulate, deeply fissured in front. More obtusely conical than *E. huzardi*, with sculpture closer and apex nearly central. (*Ad.*)

King George's Sound, S. Australia.

E. dilecta AD., P. Z. S. 1851, p. 85, no. 28.—SOWB., Thes. p. 211, f. 5; Conch. Icon. f. 23.

E. MONTROUZIERI Souverbie. Pl. 64, figs. 7, 8.

Shell ovate-oblong, much depressed-conic, apex minute, behind the middle (⅔ the length from the back margin), shortly projecting;

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front slope convex, back slope nearly straight; latticed with radiating riblets (20 in number), and concentric riblets, at the intersections forming little rasp-like points. Outside dull white, inside white, shining, radiately and subnodulately sulcate; margin crenulated; fissure narrow, subelongate, equaling ⅓ of the distance from front margin to summit. Length 8, width 6, alt. 2½ mill. (*Souv.*)

Island of Art, New Caledonia.

E. montrouzieri Souv. Journ. de Conchyl. xx, 1872, p. 56, t. 1, f. 7.

Differs from the closely allied *E. clathrata* Pse. in having the fissure shorter, the shell wider, side margins nearly level, not arched. It is less elevated than *E. fenestrella* Dh. There are fine transverse markings on this shell, just as there are on *E. clathrata, fenestrella, bicancellata*, etc. I have seen but a single specimen.

E. CLATHRATA Pease. Pl. 63, fig. 12.

Shell oblong-ovate, depressed; basal side-margins strongly arched; apex a little back of the posterior third of the shell's length; length of the slit contained 4–4½ times in length of shell.

Surface having 20–21 strong radiating ribs, each one having a series or band of fine close transverse incised marks down its center, visible under a lens. Interstices cut into pits by concentric cords which are less high than the ribs and scarcely modify the latter at their intersections. There are about as many concentric cords on each side of the apex as there are millimeters in the width of the shell; in front of the apex there are more concentric cords than at the sides and behind. Near the summit the cords disappear, fine concentric ripples taking their place. In the pits a strong lens shows regularly arranged series of dots. Inside white, showing whiter rays and under a lens tessellated with blocks of dots.

Length 9, width 6, alt. 2 mill.

Sandwich Is.

E. clathrata Pse., P. Z. S. 1862, p. 241.

The *E. clathrata* of Sowerby (Thes. p. 212, f. 54, and Conch. Icon. f. 35) is not the same. These figures represent a much shorter shell than any in the two suites before me, received from Pease.

E. SUBCLATHRATA Pilsbry. Pl. 28, fig. 27.

Depressed, broad behind, narrowed in front; interstices foveolate, and cancellated with concentric riblets; apex placed toward the

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posterior margin; ribs large, rounded. The ribs, particularly the six or eight posterior ones, are large and rounded, the interstices deeply pitted. (*Sowb.*)

Sandwich Is.

E. clathrata SOWB., Thes., p. 212, f. 54 and Conch. Icon., f. 35, not of Pease.

E. EXIMIA A. Adams. Pl. 28, fig. 26.

Elongate-oval, much depressed, white, subpellucid; vertex posterior, inclining backward; with distant, prominent, scaly-nodose radiating ribs, interstices widely cancellated with transverse and longitudinal ribs; the whole surface beautifully decussated with radiating and concentric lines; margin of the aperture denticulate, deeply incised in front. Remarkable for the large regular pits between the ribs. (*Ad.*)

San Nicholas, Zebu, Philippines, under stones at low water.

E. eximia A. AD., P. Z. S. 1851, p. 86, no. 33.—SOWB., Thes., p. 212, f. 63.

E. OBOVATA A. Adams. Pl. 28, fig. 11.

Elongate, obovate, depressed-conical, testaceous, summit subcentral, inclined backward; cancellated with scaly radiating riblets and elevated concentric liræ; aperture rounded behind, narrowed in front, margin creno-denticulate, deeply incised in front. Shortly cancellated, the slit very long. (*Ad.*)

Catbalonga, Is. of Samar, Philippines, 4 fms., on stones.

E. obovata AD., P. Z. S. 1851, p. 83, no. 16.—SOWB., Thes. p. 212, f. 6; Conch. Icon. f. 2 *b*.

E. ACULEATA A. Adams. Pl. 28, fig. 23.

Elongate-oval, depressed, rufescent, vertex a little behind the middle, inclined backward; with prominent, spiny-roughened radiating ribs, interstices deeply latticed; margin of aperture denticulate, fissure profound. Not so enlarged posteriorly as *E. obovata.* (*Ad.*)

Habitat unknown.

E. aculeata AD., P. Z. S. 1851, p. 86, no. 36.—SOWB., Thes. p. 212, f. 58; Conch. Icon. f. 49.

The narrow brown rays give a sprightliness of appearance to this little species, says Sowerby.

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E. SCABRIUSCULA A. Adams. Pl. 28, fig. 31.

Elongate-elliptical, depressed conic, testaceous, vertex subposterior, inclined backward; cancellated, with sharp, unequal, scaly-subspinous radiating ribs and elevated concentric lines; aperture narrower in front, base arcuate, margin creno-denticulate. Distinguished by the small red spots on the intermediate smaller ribs. (*Ad.*)

Habitat unknown.

E. scabriuscula AD., P. Z. S. 1851, p. 83, no. 15.—SOWB., Thes., p. 213, f. 36; Conch. Icon., f. 30.

E. SCABRICOSTATA A. Adams. Pl. 28, fig. 24.

Oval, much depressed, whitish, ornamented in front with three buff, radiating bands; vertex subcentral, inclined backward; radiating ribs distant, corrugated, interstices deeply latticed and corrugated; margin of the aperture dentate and denticulate, deeply incised in front. The broad ribs of this little flat shell are minutely scabrous, and *E. pumila* of A. Adams being similarly characterized the two shells are here re-united. (*Sowb.*)

Id. of Corrigidor, Bay of Manilla, on dead shells, 12 fms.

E. scabricostata AD., P. Z. S. 1851, p. 85, no. 29.—SOWB., Thes. p. 216, f. 61.

E. VANIKORENSIS Quoy & Gaimard. Pl. 64, figs. 37, 38.

Shell oblong conic, arcuate, fragile, white; margin crenulated; longitudinal ribs rough; transverse striæ granulate; fissure narrow. Summit median, obtuse, a little inclined backward. The ribs are large, rough, and rendered nodulous by the transverse striæ. (*Q.*)

Length 6, width 4 mill.

Island of Vanikoro.

E. vanikorensis Q. & G. Voy. Astrol. iii, p. 334, t. 68, f. 19–20.

E. LÆVICOSTATA A. Adams. Pl. 28, fig. 22.

Small, elliptical, much depressed, apex subposterior, inclined backward; with about 14 smooth radiating ribs, the interstices broadly clathrated with longitudinal riblets and transverse lines; margin of aperture denticulated, deeply incised in front. The cancellated ribs of this little flat species are comparatively smooth and the interstices deeply pitted. (*Ad.*)

Habitat unknown.

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E. lævicostata Ad., P. Z. S. 1851, p. 57, no. 37.—Sowb. Thes., p. 216, f. 57.

E. BELLA Gabb. *Unfigured.*

Monterey, Cal.

E. bella Gabb, Proc. Cal. Acad. iii, p. 188, 1865.

Section *Nesta* H. Adams, 1870.

Nesta Ad. P. Z. S. 1870, p. 5.

Shell oblong-oval, convex above; apex terminal, subincurved, outside decussated; dorsal sulcus ending in a fissure; margin of aperture crenulated. (*Ad.*)

E. NESTA Pilsbry. Pl. 28, fig. 10.

Shell oblong-oval, thin; beautifully decussated with elevated very delicate concentric and radiating lirulæ; snowy-white; dorsal sulcus with distinct sides, transversely striated; front fissure strong; margin of aperture a little thickened behind, delicately crenulated all around. Length 5½, width 3, alt. 1¾ mill. (*Ad.*)

Red Sea.

Nesta candida H. Ad. P. Z. S. 1870, p. 5, t. 1, f. 1, 1a; not *Emarginula candida* Ad.

I am compelled to change the name of this shell as *candida* has been used several times in *Emarginula*. I fail to see that *Nesta* has any generic characters. It is simply an *Emarginula* in which the recurved apex is bent down more than usual.

? Section *Emarginella* Pilsbry, 1891.

Founded on *E. cuvieri* Aud. The animal is black, very voluminous, mantle extending far over the borders of the foot and partially enveloping the shell; epipodial papillæ well-developed. Shell coarsely latticed.

E. CUVIERI Audouin. Pl. 64, fig. 32.

Savigny, Descrip. de l'Egypte., Coq. t. 3, f. 2. 1, 2. 2, 2. 3, 2. 4, 2. 5, 2. 6, 2. 7.—*Emarginula cuvieri* Audouin, Issel, Mal. Mar Rosso, p. 316.—*E. cuvieri* Cooke, Ann. Mag. N. H 1885, xvi, p. 271, (*E. clypeus* Ad. and *planulata* Ad. said to be the same.)

Red Sea; Gulf of Suez.

Subgenus Rimula Defrance, 1827.

Rimula (Rimulaire or Rimule) Defrance, Dict. des Sci. Nat. XLV, p. 471, 472. Type *R. blainvillii* Defr., *l. c.* p. 472, t. 48 bis., f. 1, 1a, 1b.

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The figures of the type species, a fossil, show clearly that the recent forms are correctly referred to this group. These figures are copied (printed from the same plates?) in Blainville's *Manuel.*

The shell is, in effect, an *Emarginula* in which the slit has become closed, making a hole, situated half-way up the front slope. There is a slit-fasciole extending upward from the hole as in *Emarginula.* This group is modified from *Emarginula* in the same way *Schismope* is from *Scissurella.* It forms a step in the progress of *Emarginula* toward *Puncturella.* There is, of course, no internal septum or "deck."

Most authors have considered *Rimula* a genus but the shells do not exhibit as much differentiation from *Emarginula* as *Subemarginula* and other groups which I have considered of generic value. *Semperia* of Crosse forms a connecting link between *Rimula* and *Emarginula.*

Indo-Pacific species.

E. EXQUISITA A. Adams. Pl. 64, figs. 3, 4.

Large, oval, semipellucid, white, cancellated with radiating ribs and elevated concentric lines; cancelli subquadrate; ribs crenulated, unequal, prominent; anterior two diverging; interstices having two riblets; above the perforation concave; perforation elongate, subquadrate. (*Ad.*)

Catanuan, Id. of Luzon, and Id. of Burias, Philippines; on dead shells in 7–10 fms.

R. exquisita AD. P. Z. S. 1851, p. 226, no. 1.—AD. in Thes. iii, p. 210, f. 3, 4.

E. CARINATA A. Adams. Pl. 63, fig. 8.

Small, oval, ornamented with very many simple, close, radiating riblets; interstices cancellated, cancelli punctiform; two anterior riblets converging in front and united at the margin of the aperture; interstices above the perforation convex, extending over the summit, *falsely* carinated; perforation oval, narrow, narrowed in front. (*Ad.*)

Cagayan, province of Misamis, Mindanao, Philippines; on dead shells, 25 fms.

R. carinata AD. P. Z. S. 1851, p. 226, no. 3.—AD. in Thes., p. 210, f. 5.

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E. CUMINGII A. Adams. Pl. 63, fig. 9.

Small, ovate, opaque, cancellated with radiating longitudinal riblets and thick concentric lines; cancelli transverse, elongate; ribs nodulous, subequal, prominent, distant; two front ones diverging, interstices having two riblets; perforation elongate, subquadrate. (*Ad.*)

Eastern Seas.

R. cumingii AD., P. Z. S. 1851, p. 227.—ADAMS in Thes. p. 210, t. 245, f. 1.

E. PROPINQUA A. Adams. Pl. 64, fig. 29.

Small, elongate-oval, with subdistant, prominent roughened radiating riblets, interstices deeply cancellated; cancelli transverse, subquadrate; two anterior riblets converging anteriorly, joined at the margin of the aperture; perforation narrow-oval, acuminate in front. (*Ad.*)

Catapan, Philippines.

R. propinqua AD., P. Z. S. 1851, p. 227, no. 4.—AD. in Thes. iii, p. 210, f. 2.

E. MARIEI Crosse. Pl. 22, figs. 34, 35, 36.

Shell elongate-ovate, thin, subopaque, with radiating subnodose ribs, cancellated with close concentric riblets, making nodes where they cross the radii; pale buffish-tawny; apex a little obtuse, fissure elongate-subquadrate, margined within. Inside smooth, shining; muscle-scar scarcely apparent; margin subdenticulate.

Length 4¼, width 3, alt. 2 mill. (*Crosse.*)

Noumea, New Caledonia; very rare under stones.

Rimula mariei CROSSE, Journ. de Conchyl. 1866, p. 167, t. 5, f. 7.

E. VERRIERI Crosse. Pl. 63, figs. 20, 21, 22.

Shell oval, thin, perceptibly translucent, having radiating alternately larger and smaller ribs, crossed by quite elevated lines, arched inward in the interstices of the ribs. Color a dull grayish-white. Summit recurved, blackish-gray. Perforation elongated, narrowly oval. Aperture oval, gray-whitish, blackish in the middle. Margins denticulate. Length a little more than 7, width 4½, alt. 3 mill. (*Crosse.*)

Noumea, New Caledonia.

Rimula Verrieri CROSSE, Journ. de Conchyl. xix, 1871, p. 205; *l. c.* 1872, p. 68, t. 2, f. 8.

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This species, large for a Rimula, approaches *R. exquisita* Ad. but may be separated from that form by the sculpture. The concentric elevated threads in passing over the ribs form nodes at their points of intersection.

American species.

E. FRENULATA Dall. Pl. 27, fig. 54.

Shell ovate, resembling in general shape and color a single valve of *Limatula ovata* Wood; apex small, laterally compressed, sharp; nucleus very minute, sculpture of fine distinct radiating threads, with an intercalary finer thread between nearly every pair. Concentric sculpture of about equally strong threads, which reticulate, but do not pass over or nodulate the radiations; they are not strictly concentric, being somewhat flexuous or broken at the sides, and somewhat bifurcated. Anal fasciole shallow, continuous from the fissure to the apex, narrow and marked with semilunar incremental ridges; fissure small, shaped like the top of an exclamation point (!). Interior glossy, the fasciole marked by two faint ridges extending to the apex; margin of the shell crenulated by the sculpture, apex reaching almost or quite as far back as the posterior margin, but a little raised above it, fissure a little variable in position, but mostly in the anterior third of the shell; dorsal surface gently convexly curved. Length 6·25, breadth 3·75; alt. 2·3 mill. (*Dall.*)

West Florida and the Keys.

R. frenulata DALL., Blake Gastrop., p. 406, t. 28, f. 4.

This lovely little shell is remarkably distinct from any of the described species known to me.

E. MAZATLANICA Carpenter. Pl. 63, fig. 10.

Shell small, oblong, compressed, conical; whitish covered with a thin whitish-brown epidermis; apex planate, narrow; surface delicately cancellated, cancelli quadrate; fissure subelongate, subquadrate, within suboval, calloused; slit occupying a portion extending from ¼ to ½ the entire length from apex to margin; slit-fasciole extending to apex, crossed by growth lines; margin delicately crenulated.

Mazatlan, on Spondylus calcifer.

Rimula mazatlanica CPR., Cat. Mazat. Sh. p. 222, 1857.—AD., in Thes. p. 210, f. 6.

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* * *

RIMULA ECHINATA Gld. *Gaspé Straits.*

"An imperfect description from the figure of a shell unfortunately lost or missing. * * * may possibly be *R. propinqua* A. Ad." (Gld. Proc. Bost. Soc. vii, p. 163).

Genus SUBEMARGINULA Blainville, 1825.

Subemarginula BLAINV., Manuel de Malacol. p. 501, type *Em. emarginata* Blainv.—*Hemitoma* SWAINSON, Malacol. p. 356.—*Siphonella* ISSEL, Mal. Mar Rosso, p. 232, 1869.

Shell rounded-oval, conical, apex near the middle, curved backward; surface radiately ribbed; anal notch generally short, continued upward as a groove inside, occupying the end of a slightly prominent anterior rib, which is not sculptured differently from the other ribs.

The great muscle scar exhibits a peculiarity diagnostic of this genus: its anterior terminations are recurved and produced inward toward the cavity of the apex. This character is found in all of the sections I have grouped under *Subemarginula*, including *Tugalia*.

This genus differs from Emarginula in having no distinctly differentiated anal fasciole extending upward from the notch or slit in the front edge of the shell. This slit is usually a little to the right of the middle.

Several sections may be distinguished:

SUBEMARGINULA *s. s.* Shell short-oval, apex near the middle, a groove continuing upward inside from the anal notch.

Under this as subsections may be grouped (1) *Clypidina* Gray, in which the anal notch is short, the space within the muscle-scar having a dark mushroom-shaped figure; this includes most of the oriental species. (2) *Plagiorhytis* Fischer, like the last, but the anal notch distinctly to the right, includes *S. stellata* and *S. sulcifera*.

TUGALIA Gray. Shell oblong, depressed, apex posterior, front margin without a notch, either rounded or sinuous; no internal anal groove; no enlarged rib in front.

Section SUBEMARGINULA s. str.

American species.

S. OCTORADIATA (Gmelin) Ad. Pl. 29, figs. 17, 18, 37.

Primary ribs 8, not forking or double; front margin scarcely notched.

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Shell oval, conical; front margin not notched; apex subcentral, inclined backward and to the right side; front slope convex, back slope straight; sculptured with strong radiating ribs of which 8 at equal distances are larger, extending from apex to basal margin, 8 shorter secondary ribs, and on large specimens still smaller tertiary riblets. All of these are rudely nodulose. Color white or greenish outside. Interior olive-green (or sage-green), white in the center and around the margins. Anterior groove narrow, rather deep. Margin coarsely dentate. Length 24, breadth 20, alt. 10 mill.

Tortugas to Barbados, Nicaragua and Aspinwall.

Patella octoradiata (in part) GMEL., Syst. Nat. xiii, p. 3699.—*Subemarginula octoradiata* A. AD., P. Z. S. 1851, p. 90, founding Gmelin's species upon "*Patella alba, paucis et valde eminentibus striis stellata*" LISTER, t. 532, f. 11 (Barbados).—*Emarginula octoradiata* Gm., ARANGO, Faun. Mal. Cub. p. 229.—DALL, Catal. Mar. Moll. S. E. U. S. p. 170.—*Emarginula tricostata* SOWB., Genera, f. 6 (inside only figured, scarcely recognizable).—*E. tricostata* Sowb., REEVE, Conch. Syst. p. 23, t. 140, f. 5, 6, good!—*E. depressa* "Blainville," SOWB., Conch. Icon. f. 3 and again, f. 55.—? *E. guadaloupensis* SOWB. 2D, Thes. p. 219, f. 69; Conch. Icon. f. 60.—*E. clausa* ORB., in Sagra, Moll. Cuba, p. 269, t. 24, f. 34–36.—*E. laqueare* GRAY and *E. listeri* ANTON, *teste* Arango, on authority of Dunker.

Gmelin's description applies fairly well to this species, but his references are all at sea. In accepting Arthur Adams' first identification (1851), taking Lister's fig. 11, pl. 532 as the type, we are adopting the course pursued by most writers on the West Indian fauna. This is the *E. depressa* of Sowerby 2d. (pl. 29, figs. 17, 18), not of Blainville. A wise malacologist will decline to say what *E. depressa* Blainv. (Malacol., p. 501, t. 48bis. f. 2) may be; from its toad-stool shaped central area I would consider it an oriental form.

This is a well-known West Indian species having eight strong primary ribs, and intervening shorter ones. *The ribs have no tendency to be double, or bifurcate,* a diagnostic point of great value.

S. ROLLANDII Fischer. Pl. 64, fig. 36.

Shell small, oval, apex subcentral, anterior fissure about three times as long as wide; front slope convex, back slope straight or concave. Sculptured with unequal radiating riblets, very variable in number (22–28); ribs irregularly beaded, the interstices bearing

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smaller riblets, and crossed by rather coarse low concentric cords. Apex recurved. The rib terminating in the slit curves a little toward the right.

Color white, pale green or pale flesh-colored; interior white, pale green or pale fleshy-brown, showing white rays.

Length 9½, width 7, alt. 3¾ mill.

Florida; Guadeloupe and St. Thomas, West Indies; Bermuda.

E. rollandii FISCHER, Journ. de Conchyl. v, p. 356, t. 12, f. 10.—*E. dentigera* HEILPRIN, Proc. Acad. Nat. Sci. Phil. 1889, p. 142, t. 8, f. 7.—*E. pileum* HEILPRIN, *l. c.*, p. 142, t. 8, f. 6; and The Bermuda Islands, p. 188, 189, t. 17, f. 7, 6, 1889.—*Subemarg. pumila* AD. et auct. (see below.)

In this small species it is difficult to distinguish the primary from the secondary riblets. The fissure is longer than in other species of *Subemarginula*. *E. dentigera* Heilpr. (pl. 41, figs. 26, 27) is absolutely synonymous.

Var. *pileum* Heilprin. Pl. 41, figs. 18, 19.

Decidedly more elevated than the type. Length 7½, alt. 5 mill.

Bermuda.

The figures of *dentigera* and *pileum*, copied from Heilprin, do not show the anal slit. It is present in his types, now before me.

I give here the information relating to the synonymous *E. pumila*.

E. pumila A. Adams. (Pl. 29, figs. 36). Orbiculate-oval, much depressed, apex subcentral, inclined backward; decussated with nodose, unequal radiating ribs and elevated concentric growth-lines. Margin of the aperture denticulate-crenate, in front deeply sinuated; sinus subquadrate, produced inside in a canal. (*Ad.*)

Florida; Haiti, (Dall). *Honduras*, (Sowb.).

Subemarg. pumila A. AD., P. Z. S. 1851, p. 91.—*E. pumila* SOWB., Thes. p. 216, f. 80; Conch. Icon. f. 46.—DALL, Catal. Mar. Moll. S. E. U. S. p. 170.

This is the same as *E. Rollandi* Fischer. The description of the latter is about five years later in date than Adams' but being accompanied by an excellent figure (while that of Adams' was not illustrated until many years later), I have retained the better defined name. Besides, the locality, *Honduras*, for Adams' *pumila* was not known until 1873, while Fischer described shells from a known habitat. Sowerby considers *Em. pumila* a synonym of *E. scabricostata* Ad.

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S. EMARGINATA Blainville. Pl. 64, figs. 3, 24, 25, 26.

Shell oblong, elevated, apex recurved, subcentral; principal ribs 10, three front ones prominent, stout, double; white outside and inside.

The surface is strongly, coarsely latticed by elevated concentric cords or lamellæ crossing the radiating ribs. Of the latter, three front ones are prominent, the middle one elevated, the two side-ribs double; there are three riblets in each interval between the 10 primary ribs, sometimes more by the intercalation of minute ones; color white or yellowish; interior white; anterior groove distinct, ending in a slight notch. Margins irregularly denticulate, 30–35 denticles (large and small) in all. Ends elevated, so that the shell rests upon the side-margins alone, when placed upon a plane surface.

Length 25, breadth 14, alt. 13 mill.

Length 23, breadth 16, alt. 10 mill.

Florida Keys; St. Thomas.

Emarginula emarginata BLAINV. Malacol., p. 501, t. 48 bis., f. 3, 1825.—REEVE, Conch. Syst., p. 23, t. 140, f. 4.

This large species is allied to *E. tricarinata*, but is thinner, more irregular in form, and pure white inside.

The *E. guadaloupensis* of Sowerby (pl. 29, fig. 37) may be a synonym of this species rather than of *octoradiata*.

S. ALVEOLATA A. Adams. Pl. 29, figs. 12, 13.

Shell thin, white, subpellucid, depressed-conical; vertex subcentral, inclined backward; irregularly alveolate by radiating ribs and transverse liræ; ribs nodulose at the intersections of the liræ; pits pellucid; margin of the aperture dentate, sinuated in front, sinus produced into a canal within. (*Ad.*)

Honduras.

Subemarg. alveolata AD., P. Z. S. 1851, p. 90.—SOWB., Thes. p. 218, f. 82, 83; Conch. Icon. f. 51.

The figures given by Sowerby do not agree very well with the words *vertice subcentrali* of Adams' description.

Indo-Pacific species.

S. TRICARINATA Born. Pl. 29, figs. 7, 8, 9.

Shell an elevated recurved cone; three anterior ribs stout and prominent; interior bright green.

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Front rib strongest, ending in a notch; surface latticed by the concentric cords crossing the radiating riblets; of the latter every third one is larger, these principal ones 12 in number, including three large front ribs; a smaller riblet in each internal, and on each side of these a minute one. Interior bright green, a small central patch and the border white. Margin crenulated.

Length 21, breadth 14, alt. 12 mill.

Tonga Tabu, S. Pacific; Philippines.

Patella tricarinata BORN., Test. Mus. Cæs. Vindob. p. 423, t. 18, f. 6. Not *Patella tricarinata* Linn.—*Emarginula panhi* QUOY & GAIMARD, Voy. de l'Astrol. 327, t. 68, f. 7, 8.—*Subemarginula panhiensis* A. AD., P. Z. S. 1851, p. 90.—*E. panhiensis* SOWB., Thes. p. 218, f. 73, 74, 75.—*E. clathrata* ADS. & REEVE, Voy. Samarang, p. 69, t. 11, f. 6, 1850.

A very distinct species. This genus is already in such terrible confusion that the inevitable restoration of Born's name to this shell is a very slight additional embarrassment.

S. OLDHAMIANA Nevill. Pl. 41, figs. 32, 33.

Shell small, obliquely conical, the apex twisted to the right and backward. Surface bearing strong radiating ribs with smaller interstitial riblets, the principal ribs about 8 in number, somewhat nodose; interior yellow or green-tinged, the anal groove deep, green, notch short. Length 10, breadth 7, alt. 4 mill.

Ceylon.

E. oldhamiana NEVILL, Journ. Asiat. Soc. Beng. xxxviii, p. 162, t. 17, f. 17.

A curiously twisted little species, allied to *S. tricarinata* Born.

S. IMBRICATA A. Adams. Pl. 29, figs. 14, 15.

Ovate-oblong, subquadrangular, ashy-white, vertex small, central, inclined backward; decussated with imbricated, unequal radiating ribs and thick irregular growth-lines; margin of the aperture dentate, deeply sinuate in front, sinus subquadrate, produced in a canal within. (*Ad.*)

Mouth of Victoria River, N.-E. Australia, under stones at low water.

S. imbricata AD., P. Z. S. 1851, p. 91.—*E. imbricata* SOWB., Thes. p. 217, f. 70, 71.

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The *E. octoradiata* of Sowerby (pl. 29, fig. 4) is probably a form of this species. It is not the *octoradiata* of Gmelin and authors generally.

S. AUSTRALIS Quoy & Gaimard. Pl. 29, figs. 1, 2, 3.

Shell ovate, conic, inflated, whitish; radiating ribs alternately thick, rugose, and small; vertex median, obtuse, recurved. Margin undulating. Length 28, width 20, alt. 18 mill. (*Q. & G.*)

Australia.

E. australis Q. & G. Voy. de l'Astrol., p. 328, t. 68, f. 11, 12.—Sowb., Thes., p. 217, f. 67, 94.

S. TASMANIÆ Sowerby. Pl. 29, fig. 20.

Elevated-conical, pale tawny, with distant, large, rugose, alternately smaller radiating ribs; expanded behind, narrowed in front; fissure short, apex acute, obliquely recurved. The two prominent anterior ribs are not so much produced as in *E. australis*, while the rib formed by the cicatrix is more so; the apex is very acute and turned backward slightly on one side. (*Sowb.*)

Tasmania.

E. tasmaniæ SOWB. Thes., p. 218, f. 72; Conch. Icon., f. 58.

Section *Clypidina* Gray.

Clypidina GRAY, Syst. dist. moll. B. M. p. 164.—A. ADAMS, P. Z. S. 1851, p. 87.

Internal groove distinct, ending in a short anterior notch; area within the muscle-scar decorated with a dark figure in the form of a mushroom of the Agaricus type.

S. RUGOSA Quoy & Gaimard. Pl. 64, figs. 39–41; pl. 29, figs. 10, 11.

Shell oval, conical, apex subcentral; sculpture consisting of 13–17 primary ribs, which are narrow, raised, continuing to the apex, each interval occupied by three small riblets; cancellated by close raised concentric threads which form prickly scales where they cross the radiating ribs. Interior greenish (or white), the area within the muscle-scar dark or outlined with dark green, usually distinctly mushroom-shaped. Length 17½, width 13, alt. 8½ mill.

Australia.

E. rugosa Q. & G., Voy. de l'Astrol. Zool. iii, p. 331, t. 68, f. 17, 18.—SOWB., Thes. p. 219.—*Clypidina candida* A. AD., P. Z. S.

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1851, p. 88.—*C. annullata* Ad., P. Z. S. 1851, p. 88.—*C. scabricula* Ad., P. Z. S. 1851, p. 88.—*E. fungina* Gld., Proc. Bost. Soc. ii, p. 154, 1846; Exped. Atlas, f. 491.—*E. conoidea* Reeve, Conch. Syst. ii, p. 23. t. 140, f. 7.—*C. acuminata* Ad., P. Z. S. 1851, p. 88, no. 10.

The primary ribs are not split or double, and beween them there are three smaller riblets, the central one often largest; sometimes some of the primary ribs are suppressed on the side-slopes. The margin is very finely crenulated, the denticles numbering 60 to 72 in all. The picture of a mushroom is usually distinctly outlined in dark green or olive, in the interior. Anal groove rather deep, notch short. The basal margins are level, sides not arched upward, margin not noticably thickened.

There is a variety in which the riblets are subequal.

S. papilionacea Nevill. Pl. 41, figs. 34, 35, 36.

Ovate-elongate, subconic, moderately elevated, thin, white; apex subcentral-posterior, acuminate and incurved; surface ornamented with fifteen strong subtuberculate or scrobiculate radiating riblets, with numerous smaller ones interposed; anterior fissure moderately cut, subnarrow. Inside shining, lightly radiately sulcate; muscular impression quadripartite, two anterior parts much smaller than the posterior, all triangular, converging. Length 12½, diam. 9 mill.

The internal impression bears a striking resemblance to a butterfly; the shell is sufficiently transparent for it to be clearly discernible from the exterior. (*Nevill.*)

S. province of Ceylon.

Emarg. papilionacea G. & H. Nevill, Journ. Asiat. Soc. Beng. xxxviii, p. 161, t. 17, f. 12, 1869.

S. brevirimata Deshayes. Pl. 41, figs. 47, 48.

Shell conic, base rounded-ovate; apex subcentral, inclined backward; white, 4 or 5 radiate with green; longitudinally ribbed, riblets unequal, alternating; transversely rugose; larger radiating ribs about 25 in number. Front riblet more prominent, convex, scarcely scaly, ending in a very short slit. Interior white, marked with a pale chestnut spot at the apex.

Length 7, width 5, alt. 3 mill. (*Dh.*)

Is. of Réunion.

E. brevirimata Dh. Moll. de l'Ile Réunion, p. 46, t. 6, f. 17, 18, 16a.

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S. ASPERA Gould. Pl. 41, figs. 40, 41, 42, 43.

Four principal posterior ribs double; about 10 primary ribs.

Shell oval, elevated or depressed, apex subcentral; sculptured with about 10 principal ribs, *four of the posterior ones double* or divided by a median groove; interstitial riblets irregular, variable in number. Concentric striæ nearly obsolete in adults, fine and obsoletely prickle-scaly in the young. Color grayish-white or chocolate-brown between the larger ribs. Inside white, with or without dark radiating stripes; no distinct mushroom-shaped pattern inside the muscle-scar; anterior groove very short, but the notch rather deep; *margin thick*, obsoletely, irregularly crenulated, the *marginal denticles about* 50 *in number.*

Length 20, width 14, alt. 8 mill.

Length 18, width 13, alt. 13 mill. (most elevated seen).

Fiji, Viti and Philippine Is.; S. Australia?

E. aspera GOULD, Proc. Bost. Soc. N. H. ii, p. 154, 1846; U. S. Exped. Sh. p. 372, atlas, f. 493.—*E. cinerea* GLD., *l. c.* p. 155: atlas to Exped., f. 494.—*Subemarginula crassilabrum* A. AD., P. Z. S. 1851, p. 91.—SOWB., Thes. p. 217, f. 79.—*? S. sculptilis* AD., P. Z. S. 1851, p. 92.

I have considered the double posterior ribs, short sulcus, etc. to be diagnostic points of a species; and have united certain described forms which agree in these characters. The type of *aspera* (pl. 41, figs. 40–43) is a young shell. *E. cinerea* Gld. (pl. 41, figs. 28–31) from Fiji Is. may be distinct. It is thinner, and has a mushroom-shaped pattern inside, but the posterior ribs are double. *E. crassilabrum* Ad. (pl. 29, fig. 16), and *E. ossea* Gld. (pl. 41, figs. 22–25) from the Fiji Is. do not seem to differ.

S. SCULPTILIS A. Adams. Pl. 29, fig. 19.

Oval, obliquely conical, whitish, radiately maculated with green; summit subcentral, deeply declining backward; corrugated by radiating ribs, the interstices beautifully punctate-clathrate; prominent anterior rib crenulated; margin of aperture undulated and crenulated, rounded behind, truncated and sinuous in front, the sinus produced into a channel inside. Clathrated as in *E. Panhiensis*, but not so elevated and more compreesed at the sides, with a brown marginal spot between each of the larger ribs. (*Ad.*)

Calapan, Island of Mindoro, Philippines.

Subemarginula sculptilis AD. P. Z. S. 1851, p. 92.—*E. sculptilis* SOWB. Thes. p. 218, f. 89.—*E. sculptilis* SOWB. in Conch. Icon. f. 53.

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S. NODULOSA A. Adams. Pl. 29, fig. 23.

Shell ovate, obliquely conical, whitish-rufescent, vertex subcentral, posteriorly declining; decussated by longitudinal nodose radiating ribs, two front side ones very large, and irregular transverse liræ, margin of aperture irregular, acuminate behind, truncate in front, sinuate, the sinus produced inside into a channel. It is like Panhiensis [*tricarinata*] but the rugosities are swelled into large bosses on the large ribs. (*Ad.*)

Sibonga, Island of Zebu, Philippines, 10 fms. on small stones.

Subemarginula nodulosa AD. P. Z. S. 1851, p. 91.—*E. nodulosa* SOWB. Thes., p. 218, f. 77.

S. LAMBERTI Souverbie. Pl. 63, figs. 27, 28.

Shell oblong-ovate, patelliform, much depressed; apex minute, situated almost at the posterior third of the shell's length, shortly recurved backward and prominent; front slope convex and carinated, subconcave-plane behind, having obtuse, rather wide radiating ribs, with intervening smaller ones, especially behind, and with concentric ribs decussating the ribs and interstices; white, radiated with rosy, the rays seen on the interior; marginal slit almost none.

Length 17½, width 12, alt. 3 mill.

Is. of Lifou, (Loyalty), New Caledonian Archipelago.

S. lamberti SOUV. Journ. de Conchyl. 1875, p. 294, t. 13, f. 10.

S. POLYGONALIS A. Adams. Pl. 29, figs. 34, 35.

Elongate-oval, depressed-conic, white, 8-radiate; vertex subcentral, inclined backward; roughened by subnodulous radiating ribs (8 larger ones) and concentric growth-lines; aperture octagonal, margin crenulated, deeply sinuated in front, a canal continuing the sinus inside. (*Ad.*)

Catanuan, Philippines.

Subemarginula polygonalis AD., P. Z. S. 1851, p. 91, no. 16.—*E. polygonalis* SOWB., Thes. p. 217, f. 78.

S. CUMINGII Sowerby. Pl. 29, fig. 24.

Oblong, irregularly polygonal, broad, much depressed, sub-green, with angular rugose unequal radiating ribs; apex a little before the middle, fissure subquadrate, much more depressed and wide than *E. scutellata*, and the sculpture less deeply cut and rugose. (*Sowb.*)

Australia.

E. cumingii SOWB., Thes. iii, p. 217, f. 76; Conch. Icon. f. 41.

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S. LATA Quoy & Gaimard. Pl. 64, figs. 21, 22.

Shell small, rounded, subquadrate, conical, whitish; vertex curved; with longitudinal ribs and very delicate interrupted transverse striæ; margin crenulated. Length 8, width 8, alt. 6 mill. (*Q. & G.*)

Amboina.

E. lata Q. & G. Voy. de l'Astrol. Zool., p. 330, t. 68, f. 9, 10.

S. PULCHRA A. Adams. Pl. 28, fig. 28.

Depressed-conical, green, beautifully rayed with white; vertex subcentral, inclined backward; radiating ribs unequal, spinose, interstices transversely latticed with elevated lines; margin of the aperture denticulate, incised in front, fissure short, subquadrate. This resembles the sharper and younger specimens of *E. rugosa*, but all the radiating ribs on the anterior half of the shell are equal. (*Ad.*)

Camaguan, Philippines, low water.

E. pulchra AD. P. Z. S. 1851, p. 85, no. 24.—SOWB., Thes., p. 219, f. 50, 51.

S. CRATITIA A. Adams. Pl. 29, figs. 21, 22.

Ovate, conic, whitish, vertex obtuse, central, scarcely inclining backward; radiating ribs distant, nodulose; interstices with two longitudinal riblets and elegantly cancellated with elevated transverse lines; margin of the aperture crenulated, sinuated in front, the sinus quadrate, produced into a canal inside. Only the formation of the fissure and cicatrix distinguish this from *E. viminea*. (*Ad. & Sowb.*)

Habitat unknown.

S. cratitia AD., P. Z. S. 1851, p. 92, no. 19.—SOWB., Thes., p. 218, f. 91.

S. NOTATA Linné. Pl. 63, figs. 34, 35.

Oval, depressed, ashen, maculated and lined with black; apex back of the middle, obtuse; radiating ribs black, rugose, unequal; front margin scarcely notched, internal groove inconspicuous. (*Sowb.*)

West Indies?

Patella notata L., Syst. Nat.—*Clypidina notata* AD., P. Z. S. 1851, p. 87.—*E. notata* SOWB., Thes. p. 220, f. 86–88; Conch. Icon. f. 42.

The habitat, *West Indies*, given by Adams is doubtful. The species belongs rather to the East Indian type.

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Section *Plagiorhytis* Fischer, 1885.

Plagiorhytis FISCHER, Manuel de Conchyl., p. 860. Type *S. stellata* Ad.

S. STELLATA A. Adams. Pl. 29, fig. 33.

Rather solid, whitish, elliptical, depressed-conical, apex subcentral; with elevated subspinulose radiating ribs, interstices sharply roughened by close decussating striæ and costellæ; margin of the aperture dentate, sinus sublateral, inside produced in a canal toward the apex. This differs from any of the varieties of *E. rugosa* in the production of the ribs at their marginal termination, and the greater coarseness of the sculpture generally. (*Ad.*)

Australia.

Clypidina stellata AD. P. Z. S. 1851, p. 87, no. 7.—*E. stellata* SOWB. Thes., p. 219, f. 103.

S. SULCIFERA A. Adams. Pl. 29, figs. 5, 6.

Oval, depressed-conic, greenish; vertex obtuse, situated back of the middle; ornamented with radiating riblets, interstices hardly equal, and incremental striæ; base arcuate; margin of the aperture crenulated, incision short, sublateral, produced into a canal inside. (*Ad.*)

Habitat unknown.

Clypidina sulcifera AD., P. Z. S. 1851, p. 87, no. 5.—SOWB., Thes. p. 219, f. 84, 85.

Unfigured species.

Clypidina rudis A. Adams. Shell thick, rude, whitish, depressed-conic; 8 angulated radiating ribs, interstices decussated with longitudinal riblets and concentric lines; apex subcentral; base arcuate; margin of aperture crenulated, sinuate in front, sinus produced into a canal inside. *Hab. unknown.* (*Ad.*, P. Z. S. 1851, p. 87, no. 6).

Subemarginula galeata A. Adams. Shell grayish, rufescent, elevated-conical, thin, vertex subcentral, inclined backward; subclathrated with whitish, tuberculose radiating ribs and transverse elevated lines; front rib prominent; margin of the aperture dentate, deeply sinuated in front, sinus produced in a canal inside. *Philippine Archipelago.* (*Ad.* P. Z. S. 1851, p. 90, no. 9).

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Subemarginula arabica A. Adams. Shell whitish, thick, depressed-conical, vertex obtuse, subcentral, inclining backward; latticed with tuberculose radiating ribs and elevated transverse lines; margin of aperture thick, crenate, sinuate in front, sinus produced into a canal inside. *Red Sea.* (*Ad.* P. Z. S. 1851, p. 90, no. 10).

Subemarginula catillus A. Adams. Shell elongate-oval, much depressed, vertex little elevated, inclining backward; ornamented with thick nodulous radiating ribs and transverse lines of growth; margin of the aperture irregular, crenulated, callous inside, deeply sinuate in front. *Hab. unknown.* (*Ad.*, P. Z. S. 1851, p. 91, no. 14.)

Subemarginula denticulata A. Adams. Shell elongate-oval, white, 9–radiate, vertex acute, inclining backward; 9 thick rugulose radiating ribs; intervals having asperulate longitudinal riblets; margin of the aperture dentate and denticulate, emarginate in front, sides of incision thickened, produced in front in two teeth. *Mexico.* (*Ad. l. c.*, p. 91, no. 15.)

Emarginula (*Clypidina*) *radiata* Gould, Proc. Bost. Soc. N. H. vii, p. 163.=? *Em. australis* Linn. *teste* Tenison-Woods, Proc. Linn. Soc. N. S. Wales, ii, p. 256.

Emarginula pileata Gld. *Loo Choo.*
Emarginula altilis Gld. *Kagosima Bay*, 10 fms.
Emarginula textilis Gld. *Ousima.*

Unfigured species, described in Proc. Bost. Soc. N. H. vii, p. 162. 163.

Subemarginula picta Dunker.

(*Em. picta* Dkr. Moll. Jap. p. 24, t. 3, f. 15; Ind. Moll. Mar. Jap. p. 152.)

Allied to *Em. pulchra* A. Ad., probably a synonym of that form.

S. arconatii Issel. (Mal. Mar. Ross. p. 232.) *Unfigured.*
Gulf of Akaba.

Subemarginula rugosa H. Adams, (P. Z. S. 1872, p. 10, t. 3, f. 7.)

The name of this supposed new species is preoccupied by Quoy.

Subemarginula modesta H. Adams, (*l. c.* p. 10, t. 3, f. 8).

This form is doubtless a synonym of an East Indian species. Both this and *S. rugosa* H. Ad. were described under *Emarginula.*

Section *Tugalia* Gray.

Tugalia Gray, Guide Syst. dist. Moll. B. M. 1857, p. 163.—*Tugali* Gray, *olim.*

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Authors have considered this group either a distinct genus or a subgenus of *Scutus*. It is, however, a mere section of *Subemarginula*, with no differential characters worth speaking of, and of course no claims to generic rank. To the genus *Scutus* it has no affinity.

On the animal of *Tugalia* see A. Adams, Ann. Mag. N. H. vi, 1860, p. 112.

S. PARMOPHOIDEA Quoy & Gaimard. Pl. 43, figs. 78, 79, 80.

Shell ovate-oblong, convex and arcuate; margins denticulated; greenish-yellow; cancellated with very thin rough and close striæ; apex obtuse; fissure almost none. Length 19, breadth 11, alt. 6 mill. (*Q. & G.*)

Australia; New Zealand.

Emarginula parmophoidea Q. & G., Voy. Astrol. p. 325, t. 68, f. 15, 16.—*Tugalia parmophoroidea* A. AD., P. Z. S. 1851, p. 89.—*Tugalia parmophoridea* SOWB., Thes. p. 221, f. 5, 11, 16.—*T. parmophoidea* HUTTON, Man. N. Z. Moll. p. 106, 1880.—*T. elegans* GRAY, in Dieff. N. Z. ii, p. 240.

Sowerby has very likely wrongly identified this species. His figures do not agree with those of Quoy.

S. INTERMEDIA Reeve. Pl. 43, figs. 83, 84.

Shell oblong-ovate, broadly rounded behind, narrower toward the front, and having a very shallow notch or emargination in the front margin. Apex at the posterior fifth. Surface finely latticed all over by numerous close fine radiating riblets crossed by close elevated concentric striæ; color light buff. Interior white, margin obtuse, finely crenulated. Length 21, breadth 12, alt. 6 mill.

Port Jackson, Australia.

Parmophorus intermedius RVE., Conch. Syst., t. 139, f. 5, 6.—*Tugalia cinerea* ("Gld") SOWB. Thes., p. 221, f. 15, 17, (not *Emarginula cinerea* Gld.)

This species differs from *S. parmophoidea* in being less parallel-sided. It is, however, very closely allied.

S. CARINATA A. Adams. Pl. 43, fig. 85.

Elongate-oval, back carinated; decussated with close radiating ribs and concentric striæ; apex inclining backward; base arcuate; margin of the aperture crenulated, the sinus produced into a canal

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inside. The anterior sinus is continued to the apex as a keel without and a groove within the shell.

Philippines.

Tugali carinata A. Ad., P. Z. S. 1851, p. 89.—*Tugalia carinata* Sowb., Thes., p. 221, f. 13.

S. decussata A. Adams. Pl. 43, fig. 88.

Shell elongate-oval, whitish, planulate, back carinated; elegantly latticed with radiating riblets and elevated concentric lines; vertex acute, posterior; margin of the aperture crenulated, sinuous in front, sinus produced into a canal in front. With a regularly cancellated sculpture and a keel from the anterior margin to the apex. (*Ad.*)

Philippine Is.

Tug. decussata A. Ad. P. Z. S. 1851, p. 89, no. 10.—Sowb. Thes., p. 222, f. 12.

S. cicatricosa A. Adams. Pl. 43, fig. 86.

Shell elongate-oval, white, back much depressed; decussated with radiating riblets and concentric lines; vertex subposterior, depressed, excavated, *quasi* cicatricose, subpellucid, base arched; margin of aperture crenulated, front extremity sinuate, sinus produced in a canal within. The sinus and cicatrix as in *T. cancellata*, but the shell flat and strongly cancellated. (*Ad.*)

Philippines.

Tug. cicatricosa Ad., P. Z. S. 1851, p. 89, no. 7.—Sowb., Thes. p. 222, f. 14.

S. scutellaris A. Adams. Pl. 43, figs. 81, 82.

Elongate-oval, greenish-brown, thin, back planulate, vertex posterior, acute, scarcely elevated; decussated with subdistant radiating riblets and concentric lines of growth; front end scarcely sinuous; aperture brown within; edge crenulated. (*Ad.*)

Bais, Philippines.

Tug. scutellaris Ad., P. Z. S. 1851, p. 89.—Sowb., Thes. p. 222, f. 8, 9.

S. gigas Martens. Pl. 43, figs. 76, 77.

Shell oblong-obovate, moderately convex, concentrically rugose, radiately costulate; pale yellow; in front narrowing, distinctly emarginated, median rib wide, the rest smaller, close; posterior

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broadly rounded, having wide, subnodose, distant ribs; summit at the posterior ⅔ of the length. Inside white, shining.

Length 89, breadth 55, alt. 22 mill. (*Mts.*)

Northern Japan.

Subemarginula gigas MARTENS, Conchol. Mittheil. ii, p. 103, t. 19, Dec. 1, 1881.

This gigantic species is readily known from all others. It is called *Saru-awabi* by the Japanese, who capture and eat them the entire year.

Unfigured and undetermined species of Tugalia.

TUGALIA OSSEA ("Gould") A. Adams. Pl. 43, fig. 87.

This form is figured in Sowerby's Thesaurus, iii, pl. 249, f. 18. It is identified by Adams with *Emarginula ossea* Gould, with which it has absolutely nothing to do. It may be regarded as a lost species, and the name must in any case be abandoned, as Gould's *ossea* is a *Subemarginula.*

TUGALI RADIATA A. Adams. Shell elongate-oval, yellowish, much depressed; ornamented with rounded, a little elevated, distant, radiating ribs and concentric striæ; aperture whitish within, margin crenulated, front end scarcely sinuate. (*Ad.*)

Catanuan, Philippines.

T. radiata ADAMS, P. Z. S. 1851, p. 89, no. 9.

TUGALIA OBLONGA Pease (P. Z. S. 1860, p. 437.).

Sandwich, Is.

TUGALIA TASMANICA Tenison-Woods. *Unfigured.*

N.-E. coast of Tasmania.

T. tasmanica T.-WOODS, Proc. Roy. Soc. Tasm. 1876, p. 156, (1877.).

Genus SCUTUS Montfort, 1810.

Scutus MONTF. Conch. Syst. ii, p. 58, 59. Type *S. antipodes* Montf.=*S. ambiguus* Chemn.—*Parmophorus* BLAINVILLE, Bull. Sci. Soc. Phil. 1817, p. 25.—*Scutum* of some authors.

The shell is oblong, depressed, apex directed backward; no anal groove or slit, but the front margin more or less truncated and sinuous; surface without radiating sculpture; anterior ends of the

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muscle-scar converging but not hooked inward toward the apex, as there are in *Subemarginula*+*Tugalia*.

The shell is partly concealed by the mantle; animal black or blotched with black, snout and tentacles long; epipodial row of papillæ present; formula of dentition *x* (1) 4–1–4 (1) *x*.

This Indo-Pacific genus represents the more primitive form of the subfamily. The lack of radiating sculpture, smooth edge of the shell, and differently formed muscle-scar afford amply sufficient characters for the separation of the genus from *Emarginula* and *Subemarginula*.

Mr. E. A. Smith has thoroughly revised this genus in an excellent paper in the Quarterly Journal of Conchology, ii, p. 250, 1879. The positions there taken are undoubtedly correct, and I have been guided by them in the following account.

S. ANATINUS Donovan. Pl. 40, figs. 1, 2, 3.

Shell oblong, depressed, sides parallel or converging in front; ends rounded, the front end somewhat sinuous, not squarely truncated; surface concentrically striated, not obliquely corrugated; apex at about the posterior fourth of the length. Color buff or yellowish-brown. Inside white, usually with some purplish or orange stains; muscle-scar distinct, rugose; there are usually some punctures at and behind the apex of the cavity. An average specimen measures, length 76, breadth 36, alt. 10 mill.

Bass's Straits, Port Jackson and Sidney, Eastern and Southeastern Australia; broad variety from *Western and Southwestern coasts of Australia.*

Typical form. Shell elongate, narrow.

Patella anatina DON. in Rees' Encyclopedia, 1820, v, nat. hist. plates Conchol., t. 16.—*Scutus anatinus* E. A. SMITH, Journ. of Conchol. ii, 1879, p. 257.—*Parmophorus elongatus* BLAINV., Bull. Sci. Soc. Philom. 1817, p. 25; Dict. Sci. Nat. xxxvii, p. 557; Malacol. t. 48, f. 2, 2a.—*Emarginula elongata* SOWB., Genera, f. 1.—*Scutus elongatus* A. AD. in Sowerby's Thes. iii, t. 248, f. 1, 2; Conch. Icon. xvii, t. 1, f. 1a–b.—*S. unguis* A. AD. in part, (not Linn.) P. Z. S. 1851, p. 221.—*Parmophorus australis* LAM., CHEMN., REEVE (Conch. Syst. t. 139, f. 2–3),—HOGG, Trans. Microscop. Soc. 1868, xvi, t. 12, f. 57 (dentition).—*P. convexus* Q. & G., Voy. Astrol. iii, p. 322, t. 69, f. 5–16.

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Var. AUSTRALIS Q. & G., (pl. 40, fig. 3.) Shell proportionately broader.

Patella unguis SCHUM., part (not Linn.), Syst. Vers Test. t. 22, f. a–b.—*Parmophorus australis* Q. & G., Voy. Astrol. t. 69, f. 1–4.—*Scutus elongatus* A. AD. in SOWB., Thes. t. 249, f. 10.—SOWB., Conch. Icon. f. 1d.—*S. unguis* SOWB., (not Linn.) Conch. Icon. f. 5b.

In some of the specimens before me the side-margins are decidedly arcuate like the form called *convexus* Q. & G.

This species may be distinguished from *S. ambiguus* by its longer form and more rounded anterior end: from *S. unguis* by its lacking the corrugation of the surface characteristic of that species, and in having the apex more posterior.

S. AMBIGUUS Chemnitz. Pl. 40, figs. 9, 10, 11.

Shell shorter than *S. anatinus*, the front margin squarely truncated. Length about twice the breadth.

Length 54, breadth 28 mill.

New Zealand.

Patella ambigua CHEMN. Conch. Cab. xi, pp. 178, 181, f. 1918.—WOOD, Index Test., t. 38, f. 84.—*Scutus ambiguus* Ch., SMITH, Quart. Journ. Conch. ii, 1879, p. 258, figs. 1–3.—*S. antipodes* MONTF. Conch. Syst. ii, p. 58, 59.—*Parmophorus breviculus* BLAINV. Bull. Sci. Soc. Philom. 1817, p. 28; Dict. Sci. Nat. xxxvii, p. 558.—LAM. An. s. Vert. ed. 2, vii, p. 579.—*S. unguis* H. & A. AD. (not Linn.) Genera, iii, t. 51, f. 10a.

Fig. 11 is a dorsal view of animal showing the anterior position of the shell; fig. 10 represents Blainville's type specimen of *P. breviculus;* fig. 9, a larger specimen.

S. UNGUIS Linné. Pl. 40, figs. 4, 5, 6, 7, 8.

Shell oblong, depressed, slightly narrowing in front or parallel-sided; apex usually between the posterior third and the middle; ends rounded, the front emarginate more or less. Surface concentrically wavy-striate and obliquely corrugated. Color buff or white. Inside white or with bluish zones; muscle-scar not very distinct; no punctures at the apex of the cavity.

Length 33, breadth 18, alt. 7 mill.

Length 54, breadth 28, alt. 8 mill.

Length 28, breadth 15, alt. 7 mill.

Port Essington and Moreton Bay, Australia; New Ireland; New Caledonia; Hong Kong, China; Japan; Cape of Good Hope to Red Sea; Bombay; Philippines.

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Patella unguis L., Mus. Uhlricæ p. 69; Syst. Nat. xii, p. 1260 (pt.).—HANLEY, Ipsa Linn. Conch. p. 5, 24, t. 3, f. 4.—*Scutus unguis* AD. (pt.), P. Z. S. 1851, p. 221.—E. A. SMITH, Journ. of Conch. ii, 1879, p. 261.—*Parmophorus granulatus* BLAINV., Bull. Sci. Soc. Philom. 1817, p. 28.—*S. granulatus* AD. in Sowb., Thes. t. 248, f. 3; t. 249, f. 20.—SOWB., Conch. Icon. f. 2a–b.—*P. imbricatus* Q. & G., Astrol. t. 69, f. 17, 18.—*P. corrugatus* RVE., Conch. Syst. t. 139, f. 1.—*S. corrugatus* AD., P. Z. S. 1851, p. 222.—SOWB., Thes. t. 249, f. 7; Conch. Icon. f. 3a–b.—TAPP.-CAN., Viag. Magenta p. 70.—*P. japonicus* CANEFRI, *l. c.* t. 2. f. 8, dentition.—*P. elegans* GRAY, Annals of Philos. 1825, p. 139.—*Emarginula brevicula* SOWB. (not *P. breviculus* Blainv.), Genera, f. 2.—*P. breviculus* SOW., CHENU, Manuel i, f. 2810.—*S. angustatus* A. AD., P. Z. S. 1851, p. 222.—*S. breviculus* A. AD. (not Blainv.) in Sowb. Thes. t. 249, f. 6; SOWB. in Conch. Icon. f. 4.—*S. elongatus* A. AD., (not Blainv.) Thes. f. 21; SOWB. in Conch. Icon. f. 1c.—*Parmophorus emarginatus* PHIL., Zeitschr. f. Mal. 1851, p. 89.—*P. rüppeli* PHIL., *l. c.* p. 89,=*P. australis* RUPPEL, (not Lam.) Atlas Reise in Nörd Afrika, t. 10, f. 5.

This shell differs from the two preceding in being corrugated on the whole or some part of the surface. The varieties pass into one another by such imperceptible degrees that any division must be artificial. Fig. 8 represents the type shell of Linné; fig. 4 is Reeve's *corrugatus;* figs. 5 and 6 are the *granulatus* of Blainville, and represent the Australian type, which is much corrugated and rather elevated; fig. 7 is a broad form with subcentral apex.

Unrecognized, unfigured and spurious species of Scutus.

P. fissurella Blainv. *P. patelloideus* Cantr.=*Tylodina.*
P. sinensis Blainv. *P. intermedius* Rve.=*Tugalia.*
P. fragilis Blainv. *P. abnormis* Nev.=*Pholas,* (dorsal plate.)
P. gibbosus Anton. *Scutum dacicum* Walch.=*Pholas,* (dorsal plate.)

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APPENDIX.

SCISSURELLIDÆ.

SCISSURELLA FUNNAZZENSIS de Greg.

A form closely resembling *S. crispata* (of which it is a variety) but nearly smooth.

Funnazzi, Sicily.

DE GREG. in Il Naturalista Siciliano, ix, t. iv, f. 9a, 9b, 9c, 9d, Nov., 1889.

HALIOTIDÆ.

HALIOTIS TUBERCULATA L. (Page 85.)

M.se T. di Monterosato has diagnosed a large number of so-called varieties of this species, and of its varieties *lamellosa* and *reticulata*. (Bull. Soc. Malac. Ital., xiii, p. 166.)

HALIOTIS NÆVOSA Mart. (P. 116.)

Add to synonymy, *H. ruber* Leach, Zoological Misc., p. 54, t. 23, 1815.

This is not a synonym of *H. rugosoplicata* but of *nævosa*.

HALIOTIS HANLEYI Ancey. *Unfigured.*

This is a form closely allied to *H. dringi* Rv. It is from the island of Nou, New Caledonia. (See Le Naturaliste, May, 1881, p. 414.)

This must not be confused with Sowerby's *H. hanleyana*.

HALIOTIS JOUSSEAUMI Mabille. *Unfigured.*

This is probably a form of *H. pustulata* Rv. Mabille does not state the locality. (See Bull. Soc. Philomathique de Paris, 7th Ser., vol. 12, 1887–1888, p. 81, 1888.)

H. CALIFORNIANA Val., H. INTERRUPTA Val., H. PARMA Val. (Recueil d'Obs. de Zool., etc., Humboldt et Bonpland, ii, pp. 267, 268, 1833.)

These three unfigured species are not recognizable from the descriptions. *H. interrupta* Val. has been referred to *H. cracherodii, juv.*; but anyone capable of judging will see that such a disposition of it is inadmissible, if the original description be read.

FISSURELLIDÆ.

FISSURELLA RUBIGINOSA Hutton (p. 216).

Von Martens (Zool. Rec., x, p. 150) supposes that this is a synonym for *Patella lacunosa*.

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FISS. BRUNNEA Anton (Verzeich, p. 27) unidentified.

F. ROSEA Lam., add to synonymy; *F. rosacea* ANTON, Verz., p. 27.

FISS. NUBECULA L. *F. mondelloensis* de Greg. (Bull. Soc. Mal. Ital., x, p. 222) is a synonym.

FISSURELLA ROBUSTA Sowerby, 2d.

Shell elevated, solid, brown, smooth or obsoletely concentrically corrugated; front slope short, posterior swollen; perforation moderate, oval, situated at ⅓ of the length. Length 40, diam. 34, alt. 25 mill. This shell lent me by Mr. Ponsonby is in a very worn condition, so that it is impossible from it to give a full description of the species; but it is of a peculiar, robust and elevated form, and its surface appears to be nearly smooth without any signs of radiating ridges (SOWB. Journ. of Conchol., Leeds, vi, p. 12, t. 1, f. 5, 6, Feb., 1889).

FISSURELLA FLAVIDA Philippi. *Unfigured.*

A species of true Fissurella, allied to *F. fulvescens* Sowb.

F. flavida PH., Mal. Bl., iii, p. 165, 1857.

FISSURELLA ALBA Philippi. Pl. 62, figs. 3, 4, 5.

Shell small, rather convex, white all over, nearly smooth, but sculptured with close impressed radiating lines and growth striæ; foramen oblong, subcentral, extremities incumbent; margin very delicately crenulated. Length 10½, lat. 6½, alt. 4½ lines. (*Ph.*)

Straits of Magellan.

F. alba PH., Archiv. f. Naturgesch. 1845, p. 61; Abbild., p. 34, Fiss., t. 1, f. 4.

FISSURELLA OBLONGA Menke, Moll. Nov. Holl., p. 33. This is probably *Megatebennus trapezina* Sowb. See Tate, Proc. Linn. Soc. N. S. Wales, vi, p. 411.

MACROSCHISMA BAIKIEI A. Adams. (P. 194.)

The name of this species is incorrectly spelled by Sowerby (see antea, p. 194). Add to references: *Clypidella Baikiei* A. AD., P. Z. S. 1854, p. 136, t. 28, f. 3.

GLYPHIS IMPEDIMENTUM Cooke. *Unfigured.*

This remarkable shell is of the same type as *arcuata*, Sow. The noteworthy features are the extreme elevation, the very gibbous form, and the fact that the apex, which is not at all prominent, is

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almost over the margin, so that the posterior end of the shell is almost perpendicular. Viewed from underneath the margins form an almost complete circle. Alt. ·35, long. ·375 in. (*Cooke.*)

Gulf of Suez.

F. impedimentum COOKE. Ann. Mag. N. H., 5th Ser., xvi, p. 270,

FISSURELLA PARVIPERFORATA Sowb. 2d, Jour. of Conch., vi, p. 12. t. 1, f. 7.

Compare *F. elevata* Dunker.

FISSURELLA VITOENSIS de Greg. (Bull. Soc. Mal. Ital., x, p. 220)= *Glyphis italica* Defr. form *depressa* Monts. (vid. l. c., xiii, p. 166).

F. MIRIGA de Greg. (l. c., p. 221) is a form of *Glyphis gibberula* Lm.

GLYPHIS FOVEOLATA (p. 207).

Add the reference: *F. foveolata* GARRETT, Proc. Cal. Acad. Sci., iv, p. 203, 1872.

✓GLYPHIS FENESTRATA Garrett. *Unfigured.*

(*F. fenestrata* GRT., Proc. Cal. Acad. Sci., iv, p. 204, 1872.)

Viti and Samoa Is.

GLYPHIS MINUTA Lam. Add to the synonymy: *Fissurella granulata* ANTON, Verzeich., p. 27, 1839 (founded on *F. minuta* "Sow. non Lmk.").

In case Lamarck's name for this species be rejected, it must be called *Glyphis granulata* Anton, this name having priority over *gemmulata* Rve.

GLYPHIS CRUCIS Beddome. *Unfigured.*

Shell oval, raised and cancellated; white or yellowish; two red lines on back, forming a cross; aperture oval.

Length 9, latitude 5, alt. 2 mill. (*Bedd.*)

Kelso Bay, Tamar River, Tasmania, 17 fms.

F. crucis BEDD. Proc. Roy. Soc. Tasm. 1882, p. 169 (1883).

PUNCTURELLA NANA H. Adams.

Shell rather solid, elevated-conic; sculptured with 15 radiating ribs, the front ones wider apart; apex acute, strongly recurved; aperture oval. Length 2, width 1¼, alt. 2 mill. (*H. Ad.*)

Red Sea.

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Cemoria nana H. AD., P. Z. S. 1872, p. 10, t. 3, f. 6; Ann. Mag. N. H., 5th Ser., xvi, p. 271.

PUNCTURELLA HARRISSONI Beddome. *Unfigured.*

Shell ovate, conical; surface sculptured with radiating ribs; apex subspiral, recurved posteriorly; perforation narrow, oval; interior with shelly plate half covering the perforation. L. 4, lat. 2·75, alt. 5 mill. (*Bedd.*)

Off Old Station, Brown's River Road, 7 fms.; *Bruny Id., Tasmania.*

Cemori Harrissoni BEDD., Proc. Roy. Soc. Tasm. 1882, p. 168 (1883).

Genus ZEIDORA Adams. (P. 246.)

Add to synoymy: *Legrandia* BEDDOME, Proc. Roy. Soc. Tasm. 1882, p. 169 (1883).

ZEIDORA TASMANICA Beddome. *Unfigured.*

Shell oval, radiately ribbed; front edge fissured; interior with a shelly plate extending ¼ the length of the shell. L. 5, lat. 3, alt. ·75 mill. (*Bedd.*)

Kelso Bay, Tamar River, Tasmania, 17 fms.

Legrandia tasmanica BEDD., *l. c.*, p. 169.

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REFERENCE TO PLATES.

Plate 1.

FIGURE.		PAGE.
1, 4.	Broderipia subiridescens Pils. Specimen,	46
5, 8.	Broderipia iridescens Brod. Specimen,	46
9, 11.	Broderipia eximia Nev. Specimen,	48
12, 14.	Stomatella godeffroyi Dkr.=Mariei Crosse,	16
15, 16.	Broderipia nitidissima Dh. Moll. Réun.,	48
17.	Haliotis tuberculata L. Animal, Fischer, Man.,	85
18, 20	Phaneta everetti H. Ad. P. Z. S.,	30

Plate 2.

1, 2.	Stomatella coccinea var. rubroflammulata Pils. Specimen,	24
3, 5.	Stomatella lyrata Pils. Specimen,	12
6, 7.	Stomatella concinna Gld. Specimen,	28
8, 10.	Gena strigosa Ad. var. Specimen,	39, 40
11, 13.	Gena strigosa Ad. var. Specimen,	39, 40
14, 16.	Gena strigosa Ad. var. Specimen,	39, 40
17, 20.	Gena planulata Lm. Specimen,	38
21, 23.	Gena auricula Lm. Specimen,	43
24, 26.	Broderipia rosea Brod. Specimen,	47
27, 28.	Broderipia rosea Brod. Thes. Conch.,	47
29, 31.	Gena lutea Linn. Specimen,	44
32, 34.	Stomatella pulchella Ad. Thes.,	28
35, 37.	Stomatella stellata var. ornatissima Pils. Specimen,	26
38, 40.	Broderipia eximia Nev. J. A. S. B.,	48
41, 42.	Broderipia iridescens Brod. Thes.,	46
43, 44.	Broderipia cumingii Ad. Ibid.,	47

Plate 3.

1–3.	Haliotis tuberculata L. Hidalgo,	85
4.	Haliotis stomatiæformis Rve. Conch. Icon.,	89
5.	Haliotis zealandica Rve. Ibid.,	102
6.	Haliotis papulata Rve. Ibid.,	97
7.	Haliotis jacnensis Rve. Ibid.,	89
8.	Haliotis lauta Rve. Ibid.,	119

Digitized by Google

FIGURE. PAGE.

9, 10. Haliotis tuberculata v. lamellosa Lm. Hid. and Conch. Icon., ... 86

PLATE 4.

11, 12. Haliotis bistriata Gmel. Thes. and Conch. Icon., . 87
13. Haliotis echinata Sowb. Thes., ... 90
14, 15. Haliotis elevata Sowb. Thes., ... 90
17, 18. Haliotis cruenta Rve. Thes. and Conch. Icon., . 99
19. Haliotis astricta Rve. Conch. Icon., ... 94
20. Haliotis coccoradiata Rve. Conch. Icon., . . . 118

PLATE 5.

21, 22. Haliotis concinna Rve. Conch. Icon., . . . 96
23. Haliotis ancile Rve. Conch. Icon., ... 100
24. Haliotis corrugata Gray. Conch. Icon., . . . 80
25. Haliotis dringii Rve. Conch. Icon., ... 96
26. Haliotis clathrata Rve.=nævosa Martyn. Conch. Icon., 116
27. Haliotis albicans Q. Conch. Cab., ... 78

PLATE 6.

28–30. Haliotis supertexta Lischke. Jap. M. Conch., . . 106
31. Haliotis diversicolor v. gruneri Ph. Jap. M. Conch., . 105
32, 43. Haliotis grayana Sowb. Thes., ... 105
34. Haliotis virginea Ch. Thes., ... 107
35. Haliotis aquatilis Rve.=japonica Rve. Conch. Icon., . 87
36. Haliotis multiperforata Rve. Conch. Icon., . . . 115

PLATE 7.

37. Haliotis gemma Rve. Conch. Icon., ... 98
38. Haliotis cunninghami Gray. Conch. Icon., . . . 116
39–41. Haliotis dohrniana Dkr. Novit. Conch., . . . 98
42. Haliotis gigantea Chemn. Conch. Icon., . . . 84

PLATE 8.

43, 44. Haliotis midæ L. Conch. Icon., ... 112
45. Haliotis pertusa Rve. (=pustulata var.). Conch. Icon., 101
46. Haliotis gigantea v. discus Rve. Conch. Icon., . . 85

PLATE 9.

47, 49. Haliotis gigantea v. kamtschatkana Jonas, . . 85
48. Haliotis speciosa v. janus Rve., ... 93
50. Haliotis glabra Chemn. Conch. Icon., ... 106
51. Haliotis excavata Lam. Conch. Icon., ... 119

Digitized by Google

Plate 10.

FIGURE. PAGE.
52. Haliotis cracherodii (californiensis). Conch. Icon., . 79
53. Haliotis cracherodii Leach. Conch. Icon., . . . 79
54, 55. Haliotis concinea Rve. Conch. Icon., . . . 103

Plate 11.

56, 60. Haliotis nævosa Mart. Conch. Icon., . . . 116
57. Haliotis pustulata Rve. Conch. Icon., ... 100
58. Haliotis planata Sowb. Thes., ... 99
59. Haliotis hanleyana Sowb. Thes., ... 91
60, see 56.

Plate 12.

61. Haliotis splendens Rve.=fulgens Phil. Conch. Icon., . 81
62. Haliotis fulgens Phil. Abbild, ... 81
63. Haliotis ziczac Rve.=glabra Ch. Conch. Icon., . . 106
64. Haliotis rugosa Rve. Conch. Icon., ... 102

Plate 13.

65. Haliotis iris Martyn. Thes., ... 110
67, 68. Haliotis brazieri Angas. Thes., ... 125
69. Haliotis pulcherrima Martyn. Conch. Icon., . . 124
70. Haliotis elegans Koch. Conch. Icon., ... 103

Plate 14.

74. Haliotis parva L. Conch. Icon., ... 120
75. Haliotis emmæ Gray. Conch. Icon., ... 122
76. Haliotis asinina L. Conch. Icon., ... 126
77. Haliotis japonica Rve. Conch. Icon., ... 87

Plate 15.

78, 79. Haliotis sieboldii Rve.=gigantea Ch. Conch. Icon., 85
80. Haliotis diversicolor Rve. Conch. Icon., . . . 104
81, 82. Haliotis revelata Dh. Moll. Réun., ... 102
83. Haliotis diversicolor v. tayloriana Rve. Conch. Icon., . 105

Plate 16.

84, 85. Haliotis tricostalis Lam. Thes., ... 123
86. Haliotis sepiculata Rve. Conch. Icon., ... 87
87, 88. Haliotis crispata Gld. Expl. Exped., . . . 109
89, 90. Haliotis speciosa Rve. Conch. Icon., . . . 92

Plate 17.

91. Haliotis varia v. viridis Rve. Conch. Icon., . . 95, 96
92. Haliotis rubiginosa Rve. Conch Icon., ... 94

Digitized by Google

FIGURE. PAGE.
93. Haliotis varia v. semistriata Rva. Conch. Icon., . 95, 96
94, 96. Haliotis virginea Ch. Ind. Moll. Guin. Inf., . . 107
97, 88. Haliotis unilateralis Lam. Conchyl. Cab., . . 97
99. Haliotis varia L. Conch. Icon., ... 95
100. Haliotis varia v. semistriata Rve. Conch. Icon., . 95, 96

PLATE 18.

1. Haliotis roei Gray. Conch. Icon., ... 127
2. Haliotis squamata Rve. Conch. Icon., ... 91
3, 4. Haliotis virginea Ch. Thes., ... 107
5. Haliotis scutulum Rve. Conch. Icon., ...
6. Haliotis sanguinea Hanley. Conch. Icon., . . . 114

PLATE 19.

7, 8. Haliotis ovina Ch. Conch. Icon., ... 124
9. Haliotis planilirata Rve. = fulgens Phil., . . . 81
10. Haliotis mariæ Gray. Conch. Icon., ... 111
11. Haliotis mariæ v. dentata Jonas. Thes., . . 111, 112

PLATE 20.

11. Haliotis rufescens Swains. Conch. Icon., . . . 82
12, 13. Haliotis rugosoplicata Ch. Thes. and Icon., . . 110
14. Haliotis squamosa Gray. Thes. and Icon., . . . 112
15, 16. Haliotis venusta Ad. & Rve. Voy. Samarang, . 91

PLATE 21.

17–21. Haliotis midæ v. elatior Pils. Specimen, . . . 113
22–25. Stomatella picta Orb. Specimen, ... 29
26. Emarginula thomasi Crosse. Journ. Conchyl., . . 264

PLATE 22.

27, 28. Haliotis pourtalesii Dall. Proc. U. S. Nat. Mus., . 121
29. Haliotis assimilis Dall. Specimen, ... 83
30–33. Stomatella godeffroyi=mariei Crse. Specimen, 8, 16
34–36. Rimula mariei Crosse. Journ. de Conch., . . 271
37–39. Schismope morleti Crosse. Journ. de Conch., . . 62
40–42. Megatebennus concatenata C. & F. Journ. de Conch., 187
43, 44. Schismope ferriezi Crosse. Journ. de Conch., . . 61
45–47. Fissurella omicron C. & F. Journ. de Conch., . . 174

PLATE 23.

48–50. Haliotis pustulata Rve. Specimen, ... 100
51. Haliotis pustulata Rve. Specimen, ... 100
56–58. Haliotis pustulata Rve. Specimen, ... 100
52. Haliotis varia v. pustulifera Pils. Specimen, . . 96
53–55. Haliotis varia Linné. Specimen, ... 95

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PLATE 24.

FIGURE.		PAGE.
59–61.	Haliotis rosacea Rve. Specimen,	93
62.	Haliotis decussata Phil.=rosacea Rve. Abbild.,	93, 94
63, 64.	Haliotis rosacea Rve., var. Specimen,	93
65.	Haliotis rosacea Rve. (type). Conch. Icon.,	93
66.	Haliotis tuberculata L. v. reticulata Rve. Specimen,	86

PLATE 25.

1–3.	Addisonia paradoxa Dall. Blake Rep.,	139
5, 6.	Cocculina rathbuni Dall. Blake Rep.,	132
7, 8.	Cocculina leptalea Ver. Tr. Conn. Ac.,	133
9, 10.	Cocculina spinigera Jeffr. P. Z. S.,	135
11, 12.	Cocculina corrugata Jeffr. P. Z. S.,	136
13–15.	Cocculina angulata Wats. Chall. Rep.,	137
16–20.	Emarginula fissura L. Forbes & Hanley,	252
21.	Cocculina adunca Jeffr. P. Z. S.,	133
22.	Cocculina pusilla Jeffr. P. Z. S.,	136
23, 24.	Cocculina beanii Dall. Blake Rep.,	132
25.	Puncturella rostrata Seg. Chall. Rep.,	245
26, 27.	Addisonia lateralis Réq. Journ. Conchyl.,	139
28.	Puncturella granulata Seg. Chall. Rep.,	242
29, 30.	Emarginula multistriata Jeffr. P. Z. S.,	252
31.	Puncturella circularis Dall. Blake Rep.,	236

PLATE 26.

32–35.	Puncturella agger Wats. Chall. Rep.,	233
36, 37.	Puncturella asturiana Fisch. Chall. Rep.,	241
38–41.	Puncturella brychia Wats. Chall. Rep.,	224
42–45.	Puncturella sportella Wats. Chall. Rep.,	235
46–49.	Puncturella oxia Wats. Chall. Rep.,	235

PLATE 27.

50, 51.	Puncturella trifolium Dall. Blake Rep.,	237
52, 53.	Glyphis fluviana Dall. Blake Rep.,	210
64.	Rimula frenulata Dall. Blake Rep.,	272
55–58.	Zeidora naufraga Wats. Chall. Rep.,	247
59, 62–65.	Emarginula crassa Sow. Forbes & Hanl.,	225
60, 61.	Puncturella eritmita V. Tr. Conn. Ac.,	238
66, 67.	Puncturella clathrata Jeffr. P. Z. S.,	232
68–70.	Puncturella noachina L. (poor figs.),	229
71, 72.	Puncturella granulosa Jeffr. P. Z. S.,	246
73, 74.	Puncturella profundi Jeffr. P. Z. S.,	243

PLATE 28.

1.	Emarginula incisura Ad. Thes.,	265
2.	Emarginula cucullata Ad. Thes.,	258

Digitized by Google

FIGURE. PAGE.
3. Emarginula fuliginea Ad. Thes., ... 263
4. Emarginula marculata Ad. Thes., ... 263
5, 6. Emarginula concinna Ad. Thes., ... 257
7. Emarginula clypeus Ad. Thes., ... 265
8. Puncturella pelex Ad. Thes., ... 241
9. Puncturella pileolus Ad. Thes., ... 241
10. Emarginula nesta Pils. (*Nesta candida* H. Ad.)P. Z. S., 269
11. Emarginula obovata Ad. Thes., ... 267
12. Emarginula variegata Ad. Thes., ... 263
13. Emarginula viminea Ad. Thes., ... 258
14. Emarginula emendata Sowb. Thes., ... 253
15. Emarginula planulata Ad. Thes., ... 264
16. Emarginula huzardi Payr. Thes., ... 249
17. Emarginula dilecta Ad. Thes., ... 265
18. Emarginula japonica Ad. Thes., ... 264
19. Emarginula conica Schum. Thes., ... 254
20. Emarginula galericulum Ad. Thes., ... 260
21. Emarginula tenuicostata Ad. Thes., ... 260
22. Emarginula lævicosta Ad. Thes., ... 268
23. Emarginula aculeata Ad. Thes., ... 267
24. Emarginula scabricosta Ad. Thes., ... 268
25. Emarginula longifissa Ad. Thes., ... 258
26. Emarginula eximia Ad. Thes., ... 267
27. Emarginula subclathrata Pils. Thes., ... 266
28. Emarginula pulchra Ad. Thes., ... 282
29. Emarginula excurvata Ad. Thes., ... 260
30. Emarginula puncticulata Ad. Thes. 262
31. Emarginula scabriuscula Ad. Thes., ... 268
32. Emarginula adamsiana Ad. Thes., ... 260
33. Emarginula punctata Ad. Thes., ... 263
34. Emarginula reticosa Ad. Thes., ... 259
35. Emarginula cancellata Ph. Thes., ... 251
36. Emarginula candida Ad. Thes., ... 258
37. Emarginula bellula Ad. Thes., ... 257

Plate 29.

1–3. Subemarginula australis Q. and G. Thes. and Astrol., 278
4. Subemarginula octoradiata Sow. (not Gmel.) Thes., . 276
5, 6. Subemarginula sulcifera Ad. Thes., ... 283
7–9. Subemarginula tricarinata Born. Thes., ... 276
10, 11. Subemarginula rugosa Q. and G. Thes., . . . 278
12, 13. Subemarginula alveolata Ad. Thes., ... 276
14, 15. Subemarginula imbricata Ad. Thes., ... 277
16. Subemarginula crassilabrum Ad. Thes., ... 280
17, 18. Subemarginula depressa Sow.=octoradiata Gm. Thes., 273
19. Subemarginula sculptilis Ad. Thes., ... 280
20. Subemarginula tasmaniæ Sowb. Thes., ... 278

Digitized by Google

FIGURE. PAGE.
21, 22. Subemarginula cratitia Ad. Thes., ... 282
23. Subemarginula nodulosa Ad. Thes., ... 281
24. Subemarginula cumingii Sowb. Thes., ... 281
25–27. Emarginula fissura L. Thes., ... 252
28, 29. Emarginula fissurata Ch. Thes., ... 264
30–32. Emarginula crassicostata Sowb. Thes., . . . 259
33. Subemarginula stellata Ad. Thes., ... 283
34, 35. Subemarginula polygonalis Sowb. Thes., . . 281
36. Subemarginula pumila Ad.=rollandi. Thes., . . 275
37. Subemarginula guadaloupensis Sow.=emarginata Bl. Thes., ... 276

PLATE 30.

1. Fissurella cumingii Rve. Conch. Icon.,. . . . 154
2. Fissurella sagittata Rve. (=mutabilis). Conch. Icon., [171, 172
3. Fissurella bridgesii Rve. Conch. Icon., . . . 151
4. Fissurella edititia=barbadensis var. Conch. Icon., . 165
5. Fissurella catillus Rve. Conch. Icon., ... 172
6. Glyphis aspera Sowb. (not Esch.?) Conch. Icon., . . 214
7. Fissurella darwinii Rve. Conch. Icon., ... 144
8, 9. Fissurella maxima Sow. Conch. Icon., . . . 145
10. Fissurella costata Lesson. Conch. Icon., . . . 148

PLATE 31.

11–13. Fissurella virescens v. nigropunctata. Specimen, . 159
14. Fissurella macrotrema Sow. Conch. Icon., . . . 159
15–17. Fissurella virescens Sowb., typical. Specimen, . 158
18, 19. Fissurella lata Sowb. Conch. Icon. and specimen, . 147
20. Fissurella clypeus Sowb. Conch. Icon., . . . 156
21, 22. Fissurella rugosa Sowb. Conch. Icon. and specimen, 161
23. Fissurella asperella Sowb. Conch. Icon., . . . 162
24. Lucapinella æqualis Sowb. Conch. Icon., . . . 197
25. Fissurella obscura Sowb. Conch. Icon., ... 163

PLATE 32.

26, 39. Fissurella limbata Sowb. Conch. Icon., . . 149
27–31. Glyphis crucifera Pils. Südaf. Moll., . . . 225
32. Glyphis stellata Rve. Conch. Icon., ... 148
32, 33. Fissurella concinna Phil. Conch. Icon. and Abbild., 146
34. Fissurella exquisita Rve. Conch. Icon., ... 148
35. Glyphis panamensis Sowb. Conch. Icon., . . . 216
36–38. Fissurella latemarginata. Specimens, . . . 153
39, see 26.

Digitized by Google

Plate 33.

FIGURE. PAGE.
40. Fissurella philippiana Rve. Conch. Icon., . . . 146
41–45. Fissurella peruviana Lm. Conch. Icon. and spec., . 155
46, 47. Fissurella maxima Sowb. Conch. Icon., . . . 145
48. Fissurella bella Rve. Conch Icon., ... 150
49. Fissurella fulvescens Sowb. Conch. Icon., . . . 152
50. Fissurella pulchra Sowb. Conch. Icon., . . . 151

Plate 34.

51–53. Fissurella crassa Sowb. Specimens, ... 154
54. Fissurella ostrina Rve. Conch. Icon., ... 160
55. Fissurella microstoma Sowb. Conch. Icon., . . . 162
56. Fissurella tegula Rve. Conch. Icon., ... 226
57. Fissurella mus Rve. Conch. Icon., ...
59. Fissurella atrata Rve.=Philippiana Rve. Conch. Icon., 147
60. Fissurella mexicana Rve. Conch. Icon., . . . 153
61, 62. Glyphis singaporensis Rve. Conch. Icon., . . 219
63. Glyphis inæqualis Sowb. Conch. Icon., ... 215
64. Glyphis inæqualis v. pica Sowb. Conch. Icon., . . 215

Plate 35.

1, 2. Fissurella nigra Lesson. Conch. Icon., . . . 149
3. Fissurella biradiata Fremb. Conch. Icon., . . . 154
4, 5. Megatebennus incarnatus Krauss. Südaf. Moll., . 186
6. Fissurella hondurasensis Rve. Conch. Icon., . . 146
7–10. Glyphis reticulata Don = græca L., . . . 205
11. Fissurella costata Less. Thes., ... 148

Plate 36.

12. Fissurella quadriradiata. Conch. Icon., . . .
13. Lucapinella limatula Rve. Conch. Icon., . . . 198
14–16. Glyphis italica Defr. Moll. Rouss., ... 210
17, 18. Glyphis calyculata Sowb. Conch. Icon., . . . 204
19. Lucapinella aculeata Rve. Conch. Icon., . . . 197
20. Glyphis ticaonica Rve. Conch. Icon., ... 225
21–24. Glyphis gibberula Lm. Moll. Rouss., . . . 221
25. Glyphis candida Sowb. Conch. Icon., ... 224
26. Glyphis exquisita Rve. Conch. Icon., ... 218
27. Glyphis digitale Rve. Conch. Icon., ... 220
28–30. Glyphis aspera Esch. Specimens, ... 214
31. Lucapina elongata Phil. Conch. Icon., ... 199
32. Fissurella nimbosa L. Conch. Icon., ... 163
33. Lucapina lentiginosa Rve.=adspersa. Conch. Icon., . 200
34–36. Fissurella rubropicta Pils. Specimens, . . . 161

Digitized by Google

Plate 37.

FIGURE. PAGE.
37–39. Glyphis listeri Orb. Moll. Cuba, ... 206
40, 41, 45. Fissurella barbadensis Gm. (antillarum Orb.). Moll. Cuba, ... 164
42–44. Fissurella barbadensis Gm. Specimens, . . . 164
46–48. Fissurella nodosa. Specimens, ... 164
49. Fissurella barbadensis Gm. Conch. Icon., . . . 164
50–53. Glyphis alternata Say. Specimens, ... 211
54. Glyphis dysoni Rve. = alternata Say. Conch. Icon., . 212
55. Glyphis crenifera Sowb. Conch. Icon., ... 216
Fig. to the right of 55, G. cayenensis Lam. (=alternata) Conch. Icon., ... 212
56. Fiss. suffusa Rve.=Lucapina cancellata Sowb. Conch. Icon., ... 200
57. F. larva Rve.=Glyphis alternata Say. Conch. Icon., . 212
58. Lucapina cancellata Sowb. Conch. Icon., . . . 200
59, 60. Clypidella fascicularis Lmk. Conch. Icon., . . 177

Plate 38.

58, 59. Glyphis sieboldi Rve. Moll. Jap., ... 204
60. Glyphis jukesii Rve. Conch. Icon., ... 208
61. Glyphis obtusa Sowb. Conch. Icon., ... 173
62. Glyphis dactylosa Rve.=funiculata Rve. Conch. Icon., 218
63, 64. Glyphis incii Rve.=lineata Sowb. Conch. Icon., . 219
65. Glyphis indusica Rve.=funiculata Rve. Conch. Icon., . 218
66. Glyphis funiculata Rve. Conch. Icon., ... 218
67. Fissurella glaucopsis Rve. Conch. Icon., . . . 169
68. Fissurella costata Less. Conch. Icon., ... 148
69. F. ægis Rve.=Lucapina adspersa Ph. Conch. Icon., . 200
70–72. Glyphis menkeana Dkr. Ind. Moll. Guin., . . 222
73–75. Glyphis benguelensis Dkr. Ind. Moll. Guin., . . 222
76–78. Fissurella natalensis Kr. Südaf. Moll., . . . 173
79. Fissurella conioides Rve. Conch. Icon., . . . 170

Plate 39.

80. Glyphis viminea Rve.=alternata Say. Conch. Icon., . 212
81. Glyphis fimbriata Rve.=jukesii Rve. Conch. Icon., . 208
82–85. Glyphis australis Kr.=ruppelli Sowb. Südaf. Moll., 217
86. Glyphis densiclathrata Rve. Conch. Icon., . . . 215
89. Megatebennus scutellum Gm. Conch. Icon., . . . 184
90. Megatebennus chemnitzii Sowb. Conch. Icon., . . 185
91. Glyphis metcalfi Rve. Conch. Icon., ...
92. Glyphis clathrata Rve. Conch. Icon., ...
93. Fissurella galericulum Rve. Conch. Icon., . . . 154
94. Fissurella coarctata King. Conch. Icon., . . . 168
95. Glyphis cyathulum Rve. Conch. Icon., . . . 209
96. Glyphis excelsa Rve.=alta C. B. Ad., ... 209

Digitized by Google

FIGURE. PAGE.
97. Glyphis octagona Rve. Conch. Icon., ... 205
98. Glyphis ocellata Rve. Conch. Icon., ... 205
99, 100. Fissurella rota Rve. Conch. Icon., ... 172
1. Glyphis fumata Rve.=alternata Say var. Conch. Icon., 211
2, 3. Fissurella mutabilis Sowb. Conch. Icon., . . . 171
4. Fissurella humphreyi Rve. Conch. Icon., . . . 167
5. Fissurella muricata Rve. Conch. Icon., . . . 156
6. Fissurella dubia Rve. Conch. Icon., ... 217
7. Glyphis salebrosa Rve. Conch. Icon., ...
8. Glyphis rüppelii Sowb. Conch. Icon., ... 217
9. Fissurella grisea Rve. Conch. Icon., ... 162

Plate 40.

1–3. Scutus anatinus Don. Conch. Icon. and Thes., . . 288
4–7. Scutus unguis L. Conch. Icon. and Thes., . . . 289
8. Scutus unguis (Linnæus' type) Ipsa L. Conch., . . 289
9–11. Scutus ambiguus Chem. Journ. of Conch., . . 289

Plate 41.

12, 13. Emarginula costulata Dh. Moll. Réun., . . . 261
14, 15. Emarginula scutellata Dh. Moll. Réun., . . . 261
16, 17. Emarginula decorata Dh. Moll. Réun., . . . 261
18, 19. Subemarginula rollandi v. pileum Heilpr. Proc. Ac. Phil., ... 275
20, 21. Emarginula spinosa Dh. Moll. Réun., . . . 262
22–25. Subemarginula ossea Gld. U. S. Expl. Exped., . 280
26, 27. Subemarginula dentigera Heilpr.=rollandi Fisch. Proc. Ac. Phil., ... 275
28–31. Subemarginula cinerea Gld. U. S. Exped., . . 283
32, 33. Subemarginula oldhamiana Nev. J. A. S. Beng., . 277
34–36. Subemarginula papillionacea Nev. J. A. S. Beng., . 279
37. Fissurella canalifera Nev. J. A. S. Beng., . . . 228
38. Fissurella scrobiculata Nev. J. A. S. Beng., . . . 227
39. Emarginula capuloidea Nev. J. A. S. Beng., . . 259
40–43. Subemarginula aspera Gld. Expl. Exped., . . 280
44–46. Emarginula fenestrella Dh. Moll. Réun., . . 256
47, 48. Subemarg. brevirimata Dh. Moll. Réun., . . 279

Plate 42.

49–51. Fissurella verna Gould. U. S. Exped., . . . 168
52–54. Glyphis menkeana Dkr. Ind. Moll. Guin., . . 222
55. Glyphis philippiana Dkr. Ind. Moll. Guin., . . . 222
56. Glyphis bengueliana Dkr. Ind. Moll. Guin., . . . 222
57–59. Fissurella occidens Gld. = peruviana Lm. U. S. Exped., ... 155

Digitized by Google

FIGURE. PAGE.
60, 61. Fiss. cratitia Gld. = Glyphis aspera Esch. U. S. Exped., ... 214
62–65. Puncturella galeata Gld. U. S. Exped., . . . 230
66–69. Glyphis cruciata Gld. U. S. Exped., . . . 225
70, 71. Puncturella cognata Gld. U. S. Exped., . . . 230
72–75. Puncturella cucullata Gld. U. S. Exped., . . 232

PLATE 43.

76, 77. Subemarginula gigas Mart. Conch. Mittheil., . . 286
78, 79, 80. Subemarginula parmophoidea Q. Thes., . . 285
81, 82. Subemarginula scutellaris Ad. Thes., . . . 286
83, 84. Subemarginula intermedia Rve. Thes., . . . 285
85. Subemarginula carinata Ad. Thes., ... 285
86. Subemarginula cicatricosa Ad. Thes., ... 286
87. Subemarginula ossea Ad. not Gould. Thes., . . . 287
88. Subemarginula decussata Ad. Thes., ... 286
89, 90, 91. Fissurellidea hiantula Lam. Voy. Amér. Mérid., 179
92. Fissurellidea hiantula Lam. Conch. Icon., . . . 179
93. Fissurellidea hiantula Lam. Animal, reduced in size, . 179

PLATE 44.

94. Megatebennus bimaculatus Dall. A. J. C., . . . 183
95, 96. Lucapina crenulata Sowb. Specimens, . . . 182
97, 98. Megatebennus nigrita Sowb. Conch. Icon., . . 187
99, 100, 1, 2. Megatebennus scutellum Gm. Specimens, . 184
3–5. Lucapinella callomarginata Cpr. Specimens, . . 196
6–8. Pupillæa aperta Sowb. Südaf. Moll., ... 180

PLATE 45.

1–4. Fissurella alba Cpr. Specimens, ... 159
5, 6. Fissurella nigrocincta Cpr. Thes., ... 160
7, 8. Fissurella concinna Phil. Abbild., ... 146
9–11. Fissurella picta Gmel. Specimen, ... 144

PLATE 46.

1. Haliotis nebulata Rve. Conch. Icon., ... 102
2, 2. Scutellina ferruginea Ad. Ads. Genera, . . . 130
3. Scutellina compressa Pse., ... 129
4, 5. Scutellina pulchella Lischke. J. M. C., . . . 128
6. Scutellina crenulata Brod., ... 128
7. Cocculina galeola Jeffr. P. Z. S., ... 137
8–11. Scutellina cinnamomea Gld. U. S. Exped., . . 128
12–14. Fissurella biradiata Fr. Specimens, . . . 153
15–17. Fissurella darwinii Rve. Specimens, . . . 144
18, 19. Fissurella oriens Sowb. Specimens, ... 152

Digitized by Google

PLATE 47.

FIGURE.		PAGE.
1, 2.	Haliotis gruneri Phil. Abbild.,	105
3, 4.	Haliotis gibba Phil. Abbild.,	108
5–7.	Haliotis coccinea Rve. Specimens,	103
8.	Haliotis tuberculata L. v. reticulata Rve. Specimen,	86
9, 10.	Haliotis virginea Ch. Ereb. and Terr.,	107

PLATE 48.

11–13.	Haliotis scabricosta Mke.=roei Gray. Abbild.,	117
14–16.	Haliotis bistriata L. Typical. Specimens,	87
17–19.	Haliotis sulcosa Phil. Abbild.,	118

PLATE 49.

20–22.	Haliotis planata Sowb. Specimens,	99
23.	Haliotis excavata Lam. Specimen,	119
24–26.	Haliotis cruenta Rve. Specimens,	99
27–29.	Haliotis emmæ Gray. Specimens,	122
30–35.	Haliotis stomatiæformis Rve. Specimens,	89
36–38.	Haliotis exigua Dkr. Ind. M. M. Jap.,	90

PLATE 50.

1.	Scissurella costata Orb. Moll. Rouss.,	50
2.	Scissurella costata v. lævigata Orb. Moll. Rouss.,	50
3–5.	Haliotis speciosa v. striata Rve. Moll. Guin. inf.,	94
6.	Haliotis capensis Dkr., young. Abbild.,	114
7, 8.	Haliotis capensis Dkr., ♀. Conch. Cab.,	114

PLATE 51.

1–3.	Gena callosa Fischer. Sav., Ægypte,	45
4, 5.	Stomatella imbricata Lam. Specimens,	9
6–8.	Stomatella doriæ Issel. Sav., Ægypte,	15
9.	Stomatella tumida Gld.=papyracea Ch. U. S. Exped.,	10
10.	Stomatella elegans Gray. Voy. Fly.,	11
11.	Stomatella rufescens Gray. Voy. Fly.,	17
12–14.	Stomatella decolorata Gld. U. S. Exped.,	16
15, 16.	Stomatella elegans Gray. Specimens,	11
17–19.	Stomatella maculata Q. & G. Voy. Astrol.,	13
20, 21.	Gena nigra Q. & G. Voy. Astrol.,	38
22.	Stomatella margaritana Ad. Thes.,	22
23, 24.	Stomatella granosa Lambert. Journ. de Conch.,	27
25.	Stomatella speciosa Ad. Thes.,	19
26–28.	Stomatia rubra Lam. Moll. Mar. Jap.,	33
29, 30.	Stomatia angulata Ad. Specimens,	32
31, 32.	Scissurella umbilicata Jeffr. P. Z. S.,	52
33–35.	Stomatia (Microtis) hæckeliana Cr. Journ. de Conch.,	36

Digitized by Google

PLATE 52.

FIGURE.		PAGE.
36, 37.	Stomatia splendidula Ad. Thes.,	34
38, 39.	Stomatella baconi Ad. Thes.,	10
40, 41.	Stomatella haliotoidea Sowb. Thes.,	20
42.	Stomatella fulgurans Ad. Thes.,	18
43.	Stomatella articulata Ad. Thes.,	13
44, 45.	Stomatella orbiculata Ad. Thes.,	16
46, 47.	Stomatella papyracea Ch. Thes.,	10
48, 49.	Stomatella notata Ad. Thes.,	19
50, 51.	Stomatella notata Ad. Thes.,	19
52.	Stomatella biporcata Ad. Thes.,	21
53, 54.	Stomatella bicarinata Ad. Thes.,	21
55, 56.	Stomatella coccinea Ad. Thes.,	24
57, 58.	Stomatella arabica Ad. Thes.,	22
59.	Stomatella sulcifera Lam. Thes.,	11
60, 61.	Stomatella maculata Q. & G. Thes.,	13
62.	Stomatella imbricata Lam. Thes.,	9
63–66.	Euchelus cancellatus. (See vol. XI.)	
67.	Stomatella cumingii Ad. Thes.,	13

PLATE 53.

68–72.	Stomatella mariei Cr. J. de C.,	15
73.	Stomatella selecta Ad. Thes.,	17
74, 75.	Stomatella montrouzieri Pils. J. de C.,	27
76, 77.	Stomatella stellata Souv. J. de C.,	25
78, 79.	Stomatella elegans Gray. Thes.,	11
80, 81.	Stomatella calliostoma Ad. Thes.,	22
82.	Stomatella pallida Ad. Thes.,	20
83.	Stomatella modesta Ad. Thes.,	23
84.	Stomatella tigrina Ad. Thes.,	21
85, 86.	Stomatella sanguinea Ad. Thes.,	18
87.	Euchelus cancellatus. (See vol. XI.)	
88, 89.	Stomatella candida Ad. Thes.,	20
90.	Stomatella elata Ad. Thes.,	23
91.	Stomatella dilecta Sowb. Thes.,	25
92.	Stomatella monilifera Ad. Thes.,	14
93.	Stomatella scitula Ad. Thes.,	15
94.	Stomatella clathratula Ad. Thes.,	14
95.	Stomatella malukana Ad. Thes.,	14
96.	Stomatia rubra Lam. Thes.,	33
97.	Stomatella japonica Ad. Thes.,	20

PLATE 54.

1–3.	Stomatia australis Ad. Thes.,	31
4, 5.	Stomatia duplicata Sowb. Thes.,	31
6.	Stomatia angulata Ad. Thes.,	32
7.	Stomatia decorata Ad. Thes.,	33

Digitized by Google

FIGURE. PAGE.
8–10. Stomatia duplicata Sowb. P. Z. S., ... 31
11. Stomatia notata Ad. P. Z. S., ... 19
12. Stomatia decussata Ad. Thes., ... 32
13. Stomatia variegata Ad. Thes., ... 34
14, 15. Stomatella depressa Sowb.=notata Ad. Thes., . 19
16, 17. Stomatia phymotis Helbl. Thes., ... 30
18. Stomatia acuminata Ad. Thes., ... 32
19, 20. Stomatia picta Orb. Moll. Cuba, ... 29
21, 22. Stomatia phymotis v. obscurata Lm. Thes., . . 31
23, 24. Stomatia lirata Ad. Thes., ... 33
25–27. Stomatia (Microtis) tuberculata Ad. Thes., . . 35
28–30. Stomatia (Microtis) tuberculata Ad. P. Z. S., . . 35
31–33. Stomatia rubra Lam. Thes., ... 33
34. Stomatia australis Ad. Thes., ... 31

PLATE 55.

1–3. Gena planulata Lam. Thes., ... 38
4. Gena plumbea Ad.=strigosa Ad. Thes., . . . 39
5–7. Gena nigra Ad.=strigosa Ad. Thes., . . . 39
8, 9. Gena lutea L. Thes., ... 44
10, 11. Gena caledonica Crosse. J. de C., ... 42
12. Gena rosacea Pse. A. J. C., ... 41
13. Gena nebulosa Ad. Thes., ... 42
14. Gena lentricula Ad. Thes., ... 44
15, 16. Gena lævis Pse. A. J. C., ... 41
17, 18. Gena lineata . Thes., ... 45
19–21. Gena varia Ad. Thes., ... 45
22, 23. Stomatella crassa Montr. J. de C., ... 26
24, 25. Stomatella asperulata Ad. Thes., ... 28
26. Stomatella caliginosa Ad. Thes., ... 27
27, 28. Stomatella concinna Ad. Thes., ... 28
29, 30. Gena ornata Ad. Thes., ... 45
31, 32. Gena strigosa Ad. Thes., ... 39
33. Gena dilecta Gld. Thes., ... 40
34, 35. Gena striatula . Thes., ...

PLATE 56.

1–3. Pleurotomaria adansoniana C. & F. J. de C., . . 72
4–6. Pleurotomaria quoyana F. & B. 70
7–9. Pleurotomaria beyrichi Hilg. Conch. Mittheil., . 71

PLATE 57.

1–7. Schismope cingulata Costa. P. Z. S., ... 61
8, 9. Scissurella conica Orb. Voy. Amér. Mérid., . . 53
10, 11. Scissurella beyrichi (fossil). J. de C.
12. Scissurella mantelli Woodw. P. Z. S., ... 54

Digitized by Google

FIGURE. PAGE.
13, 14. Pleurotomaria rumphii Schep. Thes., . . . 71
15, 16. Scissurella hoernesi Semp. J. de C., . . . 51
17, 18. Scissurella kœneni Semp. J. de C., ... 51
19, 20. Scissurella philippiana (fossil). Thes., J. de C.,

PLATE 58.

21–23. Fissurella punctatissima Pils. Specimen, . . 150
24–26. Fissurella philippiana Rve. Abbild., . . . 146
27. Fissurella longifissa Sowb. Conch. Illustr., . . 163
28. Fissurella monilifera Sowb. Thes., ... 162

PLATE 59.

29. Fissurella melvillei Sowb. P. Z. S., ... 174
30, 31. Macroschisma hiatula Swains. Sby. Genera, . . 193
32. Macroschisma megatrema Ad. Thes., ... 193
33–35. Macroschisma weldii T.-W. Specimens, . . . 191
36, 37. Fissurella afra Q. & G. Voy. Astrol., . . . 169
38, 39. Glyphis tongana Q. & G. Voy. Astrol., . . 217
40. Fissurella balanoides Rve. Conch. Icon., . . . 174.
41. Fissurella tæniata Sowb. Thes., ... 172
42–44. Clypidella fascicicularis Lam. J. de C., . . . 177
45–47. Clypidella pustula Lam. Specimens, . . . 176
48–50. Clypidella fascicularis Lam. Specimens, . . . 177
51. Fissurella olivacea Rve. Conch. Ill., ... 174
52–54. Macroschisma tasmaniae Sowb. Specimens, . . 191
55. Macroschisma novæcaledonæ Sowb. Thes., . . . 194
57, 58. Macroschisma sinensis Ad. Specimens, . . . 190
59. Macroschisma sinensis Ad. P. Z. S., ... 190
60. Macroschisma cuspidata Ad. Thes., ... 193
61. Macroschisma angustata Ad. Thes., ... 194
62. Macroschisma producta Ad. Thes., ... 194
63. Macroschisma dilatata Ad. Thes., ... 193
64. Macroschisma compressa Ad. Thes., ... 193
65. Macroschisma baikiei Ad. Thes., ... 194

PLATE 60.

66–68. Fissuridea galeata Helbl. Thes. and spec., . . 175
69. Fissurella tenebrosa Sowb. Thes., ... 160
70–72. Fissurella bermudensis Pils. Specimens, . . . 165
73–75. Fissurella barbadensis Gm. Specimens, . . . 164
76. Fissurella barbadensis v. intensa Pils. Specimen, . . 165
77–79. Fissurella schrammi Fisch. Specimens, . . . 165
80, 81. Fissurella rosea v. sculpta Pils. Specimens, . . 167
82. Fissurella clypeus Sowb. Conch. Ill., ... 156
83. Fissurella verna Gld. var. U. S. Expl. Exped., . 168, 169
84. Fissurella polygona Sowb. Thes., ... 148

Digitized by Google

FIGURE. PAGE.
85–87. Fissurella alabastrites Rve. Specimens, . . . 167
88–90. Fissurella humphreyi Rve. Specimens, . . . 167
91–93. Fissurella glaucopsis Rve. Specimens, . . . 169
93 (central fig.). Fissurella alabastrites Rve. Conch. Icon., . 167
94–96. Fissurella nubecula L. Specimens, ... 170
97, 98. Fissurella nubecula L. Moll. Rouss., . . . 170
99. Fissurella nubecula L. Ipsa L. Conch., . . . 170

PLATE 61.

1–5. Lucapinella callomarginata Cpr. Specimens, . . 196
6–9. Lucapinella limatula Rve. Specimens, . . . 198
10–12. Megatebennus bimaculata Dall. Specimens, . . 183
13–15. Fissurella virescens Sowb. Specimens, . . . 158
16, 17. Glyphis alta C. B. Ad. Thes., ... 209
18. Glyphis subrostrata Gray. Thes., ... 213
19. Glyphis lanceolata Sowb. Thes., ... 221
20. Glyphis corbicula Sowb. Thes., ... 220
21, 22. Glyphis patagonica Orb. Voy. Amér. Mérid., . . 213
23. Glyphis patagonica Orb. Specimen, ... 213
24, 25. Glyphis alternata Say. Specimens, ... 211
26. Glyphis variegata Sowb. Thes., ... 224
27. Glyphis hanleyana Sowb. Thes., ... 221

PLATE 62.

1, 2. Lucapina elongata Phil. Abbild., ... 199
3–5. Fissurella alba Phil. Abbild., ...
6, 7. Lucapina aspersa Phil. Abbild., ... 199
8. Megatebennus sella Sowb. Thes., ... 185
9. Pupillæa aperta Sowb. Thes., ... 180
10–12. Megatebennus trapezina Sowb. Specimens, . . 188
13. Megatebennus complanata Sowb. Thes., . . . 186
14, 15. Megatebennus florescens Sowb. Thes., . . . 186
16–18. Fissurella volcano Rve. Specimens, . . . 156
19–21. Fissurella rosea Gmel. Specimens, ... 166
22. Macroschisma maxima Ad. Gen. Rec. Moll., . . 192
22 (central fig.). Glyphis viridula Lam. Conch. Icon., . 226
23–25. Glyphis viridula Lam. Specimens, ... 226
26 (lower central large fig.). Glyphis listeri Orb. Specimen, 206
27. Glyphis minuta Lam. Conch. Icon., ... 223
28–30. Glyphis fontainiana Orb. Voy. Amér. Mér., . . 207
31, 32. Glyphis arcuata Sowb. Thes., ... 223
33. Glyphis tenuistriatus Sowb. Thes., ... 220

PLATE 63.

1–3. Lucapina cancellata Sowb. Specimens, . . . 200
4, 5. Glyphis bombayana Sowb. Thes., ... 218

Digitized by Google

FIGURE. PAGE.
6, 7. Glyphis varicosa Sowb. Thes., ... 205
8. Rimula carinata Ad. Thes., ... 270
9. Rimula cumingii Ad. Thes., ... 271
10. Rimula mazatlanica Cpr. Thes., ... 272
11. Glyphis articulata Sowb. Thes., ... 221
12. Emarginula clathrata Pse. Specimen, ... 266
13. Glyphis granifera Pse. Specimen, ... 207
14. Glyphis lima Sowb. Thes., ... 220
15, 16. Glyphis proxima Sowb. Thes., ... 220
17–19. Glyphis foveolata Garr. Specimens, . . . 207
20–22. Rimula verrieri Cr. J. de C., ... 271
23, 24. Glyphis alta C. B. Ad. Thes., ... 209
25, 26. Glyphis tanneri V. Tr. Conn. Ac., ... 213
27, 28. Subemarginula lamberti Montr. Journ. de Conch., . 281
29, 30. Glyphis lineata Sowb. Specimens, ... 219
31, 32. Puncturella fastigiata Ad. Thes., ... 230
33. Puncturella falklandica Ad. Thes., ... 231
34–37. Puncturella nobilis Ad. Thes., ... 231
38, 39. Puncturella cucullata Gld. Thes., ... 233
40, 41. Puncturella conica Orb. Voy. Amér. Mérid., . . 230

PLATE 64.

1. Emarginula papillosa Risso. Eur. Mérid., . . . 250
2. Emarginula striatula Q. & G. Voy. Astrol., . . 259
3, 4. Rimula exquisita Ad. Thes., ... 270
5, 6. Emarg. magnifica Pils. Specimens, ... 251
7, 8. Emarg. montrouzieri Souv. J. de Conch., . . 265
9–11. Emarg. solidula. Enum. Moll. Sicil., . . . 255
12, 13. Emarg. elongata Costa. Enum. Moll. Sicil., . . 250
15. Emarg. micans Ad. Thes., ... 257
16–18. Puncturella papillosa Seg. Seg., ... 244
19 (between 16 and 20). Zeidora reticulata Ad. Thes., . 247
20. Macroschisma scutiformis Nev. J. A. Soc. Beng., . . 195
21, 22. Emarginula lata Q. & G. Voy. Astrol., . . . 282
23, 24–26. Subemarg. emarginata Blainv. Specimens, . 276
27. Zeidora calceolina Ad. Thes., ... 247
28. Emarginula maculata Souv.=souverbiana Pils. J. de C., 262
29. Rimula propinqua Ad. Thes., ... 271
30, 31. Puncturella rostrata Seg. Seg., ... 245
32. Emarginula cuvieri Aud. Coq. Ægypte, . . . 269
33. Glyphis excelsa Ads. & Rve. Voy. Samarang, . . 209
34, 35. Subemarginula notata L. Thes., ... 282
36. Subemarginula rollandi Fisch. J. de C., . . . 274
37, 38. Emarginula vanikorensis Q. Voy. Astrol., . . 268
39–41. Subemarginula rugosa, Q. typical. Specimens, . 278
42. Emarginula bicancellata Souv. J. de C., . . . 256

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INDEX TO VOL. XII.

NOTE.—The names of valid species and varieties are printed in Roman type; of genera and other groups in SMALL CAPITALS; of synonyms in *Italic*.

Abnormis (*Parmoph.*) Nev., 290
Abyssicola (Punct.) Ver., . 239
Aculeata (Emarg.) Ad., . 267
Aculeata (Fiss.) Rve., . 197
Aculeata (Lucapinella) Rve., ... 197
Aculeata (Scutellina) Pse., 130
Acuminata (*Emarg.*) Ad., . 279
Acuminata (Stomatia) Ad., 32
Adamsiana (Emarg.) Sowb., 260
Adansoniana (Pleurotomaria) C. & F., . . 72
ADDISONIIDÆ . . 138
ADDISONIA Dall. . . 138
Adriatica (*Emarg.*) Costa, . 251
Adspersa (Fiss.) Ph., 199, 200
Adspersa (Lucapina) Ph., . 199
Adunca (Cocc.) Jeff., . 133
Adunca (Tectura) Jeff., . 133
Ædonia (Sciss.) Wats., . 56
Ægis (*Fiss.*) Rve., . . 200
Æqualis (*Fiss.*) Sowb., . 197
Æqualis (Lucapinella) Sowb., ... 197
Affinis (Fiss.) Gray, . . 155
Affinis (Sciss.) Costa, . 50
Afra (Fiss.) Q., . . 169
Agger (Punct.) Wats., . 233
Alabastrites (Fiss.) Rve., . 167
Alba (Fiss.) Cpr., . . 159
Alba (Fiss.) Ph., . .
Albicans (Hal.) Q., . . 78
Alta (Glyphis) C. B. Ad., . 209
Alta (Sciss.) Wats., . . 55
Alternata (Glyphis) Say, . 211
Alternata (Hal.) Sowb., . 101
Altilis (Emarg.) Gld., . 284
Alveolata (Emarg.) Ad., . 276
Ambiguus (Scutus) Ch., . 289
AMBLYCHILEPAS Pils., . 184
Anatinus (Scutus) Don., . 288
Anatomus Ads., . . 49
Ancile (Hal.) Rve., . . 100
Angulata (Cocc.) Wats., . 138
Angulata (Sciss.) Lov., . 52
Angulata (Stomatia) Ad., . 32
Angustata (*Fiss.*) Sow., . 224
Angustata (Macroschisma) Ad., ... 194
Annullata (*Emarg.*) Ad., . 279
Antillarum (Scutellina) Schutt., ... 130
Antipodes (*Scutus*) Montf., 289
Aperta (Fiss.) Rve., . . 179
Aperta (Pupillia) Sow., . 180
Aperta (Fiss.) Sowb., . 180
Apertura (Pupillia) Gray, 181
Aquatilis (Hal.) Rve., . 87
Arabica (Scutellina) Rüpp., 131
Arabica (Stomatella) Ad., 22
Arabica (Subemarg.) Ad., . 284
Arconatii (Emarg.) Issel, . 284
Arcuata (Glyphis) Sowb., . 223
Articulata (Glyphis) Sby., 221
Articulata (Stomatella) Ad., ... 13
Asinina (Hal.) L., . . 126
Aspera (Emarg.) Gld., . 278
Aspera (*Fiss.*) Sowb., . 214
Aspera (Glyphis) Esch., . 214
Aspera (Sciss.) Ph., . . 52
Asperella (Fiss.) Sowb., . 162

Digitized by Google

Asperulata (Scutellina) Ad., 130
Asperulata (Stomatella) Ad., ... 28
Assimilis (Hal.) Dall, . 83
Asturiana (Punct.) Fisch., 241
Astricta (Hal.) Rve., . 94
Australis (Emarg.) Q., . 278
Atkinsoni (Schismope) Ten.-Woods, ... 66
Atrata (Fiss.) Rve., . . 147
Auricula (Gena) Lm., . 43
Australis (*Fiss.*) Kr., . 217
Australis (Hal.) Gm., . 111
Australis (*Parmoph.*) Rüpp., 290
Australis (*Scutus*) Lm., . 288
Australis (*Scutus*) Q., . 289
Australis (Stomatia) Ad., . 31
Baconi (Stomatella) Ad., . 10
Baikiei (Macrosch.) Ad., . 292
Bakiei (Macrosch.) Sow., . 194
Balanoides (Fiss,) Rve., . 174
Barbadensis (Fiss.) Gm., . 164
Beani (Cocc.) Dall, . . 132
Bella (Emarg.) Gabb, . 269
Bella (Fiss.) Rve., . . 150
Bellula (Emarg.) Ad., . 257
Beddomei (Sciss.) Pet., . 67
Benguelensis (Fiss.) Dkr., 222
Bermudensis (Fiss.) Pils., . 165
Bertheloti (Sciss.) Orb., . 53
Beyrichi (Pleurotomaria) Hilg., ... 71
Bicarinata (Stomatella) Ad., ... 21
Bicancellata (Emarg.) Montr., ... 256
Bicolor (*Fiss.*) C. B. Ad., . 226
Bicolor (Hal.) Costa, . 86
Bimaculata (Fissurellidea) Dall, ... 183
Bimaculata (Megatebennus) Dall, ... 183
Biporcata (Stomatella) Ad., 21
Biradiata (Fiss.) Sowb., . 154
Bistriata (Hal.) Costa, . 86
Bistriata (Hal.) Gm., . 87
Bistriata var. (Hal.) Gm., . 112
Bombayana (Glyphis) Sby., 218
Brazieri (Hal.) Ang., . 125
Breviculus (*Parmoph.*) Blv., 289
Brevirimata (Emarg.) Dh., 279
Bridgesii (Fiss.) Rve., . 157
Broderipia Gray, . . 46
Brunnea (Fiss.) Ant., . 292
Brychia (Punct.) Wats., . 234

Calcaroides (*Delphinula*) Cantr., ... 50
Calceolina (Zeidora) Ad., . 247
Caledonica (Gena) Cr., . 42
Californiana (*Hal.*) Val. . 291
Californensis (Hal.) Sw., . 79
Calliostoma (Stomatella) Ad., ... 22
Caliginosa (Stomatella) Ad., 27
Callosa (Gena) Fischer, . 45
Callomarginata (*Clypidella*) Cpr., . . . 196, 197
Callomarginata (Lucapinella) Cpr., . . . 196
Calyculata (Glyphis), . 204
Canaliculata (Hal.) Lm., . 121
Canaliculata (Hal.) S. & W., 123
Canalifera (Fiss.) Nev., . 228
Cancellata (Emarg.) Phil., 251
Cancellata (*Fiss.*) Sow., . 200
Cancellata (*Glyphis*) Dall, 201
Cancellata (Lucapina) Sowb., ... 200
Cancellata (Sciss.) Jeffr., . 50
Cancellata (Scutellina) Pse., 129
Candida (Emarg.) Ad., . 258
Candida (*Emarg.*) Ad., . 278
Candida (Glyphis) Sow., . 224
Candida (*Nesta*) Ad., . 269
Candida (Stomatella) Ad., 20
Capensis (Hal.) Dkr., . 114
Capuliformis (*Emarg.*) Ph., 254
Capuloidea (Emarg.) Nev., 259
Carinata (Hal.) Sw., . . 121
Carinata (Rimula) Ad., . 270
Carinata (Schismope) Wats., ... 65
Carinata (Sciss.) Ad., . 67

Digitized by Google

Carinata (Tug.) Ad., . 285
Catillus (Fiss.) Rve., . 172
Catillus (Subemarg.) Ad., . 284
Cayenensis (*Fiss.*) Lmk., . 212
Cemoria Leach, . . 228
Chemnitzii (Fiss.) Sowb., . 185
Chilensis (Fiss.) Sowb., . 148
CHLAMYDOGLYPHIS Pils., . 198
Chlorotrema (Fiss.) Mke., . 161
Cicatricosa (Tug.) Ad., . 286
Cingulata (Schismope) . 61
Cinnamomea (Scutellina) Gld., ... 128
Cinnaberina (Fiss.) Costa, 171
Cinerea (*Emarg.*) Gld., . 278
Cinerea (*Tug.*) Sby., . . 285
Circularis (Punct.) Dall, . 235
Clathrata (*Emarg.*) Ad., . 277
Clathrata (Emarg.) Pse., . 266
Clathrata (*Emarg.*) Sowb., 267
Clathrata (Hal.) Rve., . 117
Clathrata (Punct.) Jeff., . 232
Clathratula (Stomatella) Ad., ... 14
Clausa (*Emarg.*) Orb., . 274
Clypeus (Emarg.) Ad., 265, 269
Clypeus (Fiss.) Sowb., . 156
Clypidella Cpr., . . 195
CLYPIDELLA Sw., . 142, 175
CLYPIDINA Gray, . 273, 278
Coarctata (Fiss.) King, . 168
COCCULINA Dall, . . 131
Coccinea (Hal.) Rve., . 103
Coccinea (Stomatella) Ad., 24
Coccoradiata (Hal.) Rve., . 118
COCCULINIDÆ Dall, . . 131
Cognata (Punct.) Gld., . 230
Complanata (Fiss'idea) Sowb., ... 186
Compressa (Emarg.) Cantr., 250
Compressa (Macroschisma) Ad., ... 193
Compressa (Scutellina) Pse., 129
Compta (Microtis) M. & L., 35
Compta (Stomatella) Ad., . 14
Concatenata (Fiss.) C. & F., 187
Concinna (Emarg.) Ad., . 257
Concinna (Fiss.) Ph., . 146
Concinna (Hal.) Rve., . 96
Concinna (Stomatella) Gld., 28
Concinnus (Sciss.) Ad., . 59
Conica (Cocc.) V., . . 134
Conica (*Emarg.*) Blainv., . 251
Conica (Emarg.) Schum., . 254
Conica (*Fiss.*) Réq., . . 206
Conica (Punct.) Orb., . 230
Conica (Sciss.) Orb., . . 53
Conoidea (*Emarg.*) Rve., . 279
Conioides (Fiss.) Rve., . 170
Convexus (*Parmoph.*) Q., . 288
Conoides (Fiss.) Sowb., . 170
Cooperi (Punct.) Cpr., . 231
Corbicula (Glpyhis) Sowb., ... 220
Coreanica (Hal.) Ad., . 84
Coronata (Sciss.) Wats., . 56
Corrugata (Cocc.) Jeffr., . 136
Corrugata (*Fiss.*) Costa, . 206
Corrugata (Hal.) Gray, . 80
Corrugatus (*Parmoph.*) Rv.. 290
Corrugatus (*Scutus*) Rv., . 290
Costæ (Emarg.) Tib., . 254
Costaria (*Fiss.*) Dh., . . 211
Costaria (*Fiss.*) Sowb., . 222
Costata (Fiss.) Less., . 148
Costata (Hal.) Sw., . . 111
Costata (Sciss.) Orb., . 50
Costata (Scutellina) Ad., . 130
Costulata (Emarg.) Dh., . 261
Cracherodii (Hal.) Leach., 79
CRANOPSIS Ad., . 202, 240
Crassa (*Fiss.*) Costa, . . 211
Crassa (Emarg.) Sow., . 255
Crassa (Fiss.) Sowb., Lam. 154
Crassa (Fiss.) Sowb., . 158
Crassa (Stomatella) Montr., 26
Crassicostata (Emarg.) Sowb., ... 259
Crassilabrum (*Emarg.*) Ad., 278
Cratitia (Emarg.) Ad., . 282
Cratitia (*Fiss.*) Gld., . . 214
CREMIDES Ad., . 142, 158
Cruenta (Hal.) Rve., . 99
Crenata (Hal.) Swains, . 126
Crenifera (Fiss.) Sby., . 216
Crenulata (Fiss.) Sowb., . 182

Digitized by Google

Crenulata (Lucapina) Sowb., ... 182
Crenulata (Scutellina) Br., 128
Crepiemarginula Seg., . 246
Crispata (Hal.) Gld., . 109
Crispata (Sciss.) Fl., . . 52
Crossei (Schismope) Fol., . 66
Cruciata (*Fiss.*) Kr., . . 226
Cruciata (Glyphis) Gld., . 225
Crucifera (Glyphis) Pils., . 225
Crucis (Glyphis) Bedd. . 293
Cucullata (Emarg.) Ad., . 258
Cucullata (Punct.) Gld., . 232
Cumingii (Broderipia) Ad., 47
Cumingii (Emarg.) Ad., . 281
Cumingii (Fiss.) Rve., . 154
Cumingii (Rimula) Ad., . 271
Cumingii (Stomatella) Ad., 13
Cunninghami (Hal.) Gray, 116
Curvirostris (Emarg.) Dh., 254
Cuspidata (Macroschisma) Ad., ... 193
Cusmichiana(*Emarg.*)Brus., 249
Cuvieri (Emarg.) Aud., . 269
Cyathulum (Glyphis) Rve., 209

Dacicum (*Scutum*) Wal., . 290
Dactylosa (*Fiss.*) Rve., . 218
Dalli (Cocc.) V., . . 134
DALLIA Jeffr., . . . 137
Darwinii (Fiss.) Rve., . 144
Decipiens (Sciss.) Costa, . 50
Declinans (Sciss.) Wats, . 57
Decolorata (Stomatella) Gld., ... 16
Decorata (Emarg.) Dh., . 261
Decorata (Stomatia) Ad., . 33
Decussata (Hal.) Phil., . 93
Decussata (Sciss.) Aud., . 51
Decussata (Stomatia) Ad., 32
Decussata (Tug.) Ad., . 286
Defrancia (*Fiss.*) Risso, . 211
Delicata (Stomatella) Ad., 25
Densiclathrata (Glyphis) Rve., ... 215
Dentata (Hal.) Jonas, . 112
Denticulata (Subemarg.) Ad., ... 284
Dentigera (*Emarg.*) Heilpr., 275
Depressa (*Emarg.*) Risso, . 249
Depressa (Emarg.) Sowb., . 274
Depressa (*Fiss.*) Monts., . 206
Depressa (Stomatia) Sowb., 19
Diadora (Gray), . . 228
Digitale (Glyphis) Rve., . 220
Dilatata (Macroschisma) Ad., ... 193
Dilecta (Emarg.) Ad., . 265
Dilecta (Gena) Gld., . . 40
Dilecta (Stomatella) Sowb., 25
Diodora Gray, . . . 228
Discus (Hal.) Rve., . . 85
Diversicolor (Hal.) Rve., . 104
Dohrniana (Hal.) Dkr., . 98
Dohrnianus (Sciss.) Dkr., . 60
Dominicana (*Fiss.*) Cost., . 206
Dorbignyi (Sciss.) Aud., . 50
Dorbignyi (Sciss.) Scacc., . 50
Doriæ (Stomatella) Issel, . 15
Dorsata (*Fiss.*) Monts., . 222
Dringii (Hal.) Rve., . . 96
Dubia (Glyphis) Rve., . 217
Duplicata (Stomatia) Sow., 31
Dysoni (*Fiss.*) Rve., . . 212

Echinata (Hal.) Sowb., . 90
Echinata (Rimula) Gld., . 273
Edititia (Fiss.) Rve., . 165
Elata (Stomatella) Ad., . 23
Elatior (Hal.) Pils., . . 113
Elegans (Hal.) Koch, . 103
Elegans (*Parmoph.*) Gray, 290
Elegans (Schismope), . 61
Elegans (Stomatella) Gray, 11
Elegans (*Tug.*) Gray, . 285
Elevata (*Fiss.*) Dkr., . 217
Elevata (Hal.) Sowb., . 90
Elongata (Emarg.) Costa, . 250
Elongata (*Emarg.*) Sby., . 288
Elongata (*Fiss.*) Phil., . 199
Elongata (Lucapina) Ph., . 199
Elongatus (*Scutus*) Ad. . 288
Elongatus (*Parmophorus*) Bl., ... 288
Elongata (Scutellina) Ad., 130
Emarginata (Emarg.) Bl., 276

Digitized by Google

Emarginatus (*Parmoph.*) Ph., ... 290
EMARGINELLA Pils., . 249, 269
EMARGINULA Lm., . 202, 248
EMARGINULINÆ Pils., 141, 201
Emendata (*Emarg.*) Sowb., 253
Emmæ (Hal.) Gray, . . 122
ENTEMNOTROCHUS Fisch., [70, 71
Erecta (Punct.) Dall., . 240
Eritmeta (Punct.) V., . 238
Everettii (Phaneta) Ad., . 30
Excavata (Hal.) Lm., . 119
Excelsa (*Fiss.*) Rve., . . 209
Excelsa (Glyphis) Ad. and Rve., ... 209
Excentros (Addisonia) Jeff., 139
Excentrica (Gadinia) Tib., 139
Excurvata (Emarg.) Ad., . 260
Exigua (Hal.) Dkr., . . 90
Exigua (Hal.) Weink., . 89
Eximia (Broderipia) Nev., 48
Eximia (Emarg.) Ad., . 267
Exquisita (Fiss.) Rve., . 148
Exquisita (Glyphis) Rve., . 218
Exquisita (Rimula) Ad., . 270

Falklandica (Punct.) Ad., 231
Fasciata (*Fiss.*) Pfr., . . 200
Fasciata (*Lucapina*) Pfr., . 200
Fascicularis (Fiss.) Lm., . 177
Fastigiata (Punct.) Ad., . 230
Fenestrata (Glyphis) Gar., 293
Fenestrella (Emarg.) Dh., 256
Ferriezi (Schismope) Cr., . 61
Ferruginea (Scutellina) Ad., ... 128, 130
Ficiformis (Hal.) Mke., . 115
Fimbriata (*Fiss.*) Rve., . 208
Fissura (Emarg.) L., . 252
Fissura (*Emarg.*) Payr., . 251
Fissurata (Emarg.) Ch., . 264
Fissurata (*Emarg.*) Recl., . 253
FISSURELLA Brug., . . 142
Fissurella (Parmoph.) Blv., 290
FISSURELLINÆ Pils., . . 141
FISSURELLIDINÆ Pils., 141, 178
FISSURELLIDÆ Risso, . 140
FISSURELLIDEA Orb., . 178
FISSURIDEA Sw., . 142, 175
Fissurelloides (*Emarg.*) Nardo, ... 249
FISSURISEPTA Seg., . 202, 244
Flavida (Fiss.) Ph., . . 292
Florescens (Fiss'dea) Sow., 186
Fluviana (Glyphis) Dall, . 210
Foveolata (Glyphis) Garr., [207, 292
Fragilis (*Parmoph.*) Blv., . 290
Frenulata (Rimula) Dall, . 272
Fulgens (Hal.) Phil., . 81
Fulgurans (Stomatella) Ad., 18
Fuliginea (Emarg.) Ad., . 263
Fulvescens (Fiss.) Sow., . 152
Fumata (*Fiss.*) Rve., . 212
Funebris (Hal.) Rve., . 92
Fungina (*Emarg.*) Gld., . 279
Funiculata (Glyphis) Rve., 218
Funnazzensis (Sciss.) Greg., 291
Furonculus (*Stomax*) Montf., 31

Galathea (Scutellina) Ad., . 130
Galeata (Fiss.) Helbl., . 175
Galeata (Patella) Helbl., . 175
Galeata (*Punct.*) Gld., . 230
Galeata (Subemarg.) . . 283
Galeola (Cocc.) Jeff., . . 137
Galericulum (Fiss.) Rve., . 154
Gemma (Hal.) Rve., . 98
Gemmata (Fiss.) Mke., . 160
Gemmulata (*Fiss.*) Rve., . 223
GENA Gray, . . 7, 36
Gibba (*Fiss.*) Jeffr., . . 206
Gibba (*Fiss.*) Ph., . . 222
Gibba (Hal.) Hutton, . 108
Gibba (Hal.) Phil., . . 108
Gibba (Hal.) Rve., . . 108
Gibberula (Glyphis) Lm., . 221
Gibbosus (*Parmoph.*) Ant., 290
Gigantea (Hal.) Chem., . 84
Gigantea (Hal.) Mke., . 116
Gigas (Subemarg.) Mts., . 286
Glabra (Hal.) Chem., . 106
Glabra (Hal.) Costa, . . 86
Glabra (Hal.) S. & W., . 79

Digitized by Google

Glabra (Hal.) Swains., . 79
Glaucopsis (Fis.) Rve., . 169
GLYPHIS Cpr., . . 202, 203
Godeffroyi (Stomatella) Dkr., ... 16
Græca (*Fiss.*) L., . 205, 206
Græca (Glyphis) L., . ? . 215
Grandis (Fiss.) Sow., . 149
Granifera (Glyphis) Pse., . 207
Granocostata (Scutellina) Pse., ... 130
Granosa (Stomatella) Lamb., ... 27
Granulata (Fiss.) Ant., .
Granulata (Punct.) Seg., . 242
Granulatus (Parmoph.) Blv., 290
Granulosa (Punct.) Jeff., . 246
Granulosa (Scutellina) Ad., 130
Grisea (Fiss.) Rve., . . 152
Gruneri (Hal.) Phil., . 105
Grayana (Hal.) Sow., . 105
Guadaloupensis (*Emarg.*) Sby., ... 276

HALIOTIDÆ . . 72
HALIOTIS Linn., . . 75
Haliotoidea (Stomatella) Sowb., ... 20
Hanleyana (Glyphis) Sby., 221
Hanleyana (Hal.) Sowb., . 91
Hanleyi (Hal.) Anc., . 291
Hargravesii (Hal.) Cox., . 158
Harrisoni (*Cemori*) Bedd., 294
Harrissoni (Punct.) Bedd., 294
Heckeliana (Microtis) Crse., 36
Hiantula (Fissurellidea) Lm., ... 179
Hiantula (Fiss'idea) Sowb., 185
Hiantula (Fiss.) Rve., . 185
Hiantula (Fiss.) Sowb., . 180
Hiatula (Macroschisma) Sw., ... 193
Hoernesi (Sciss.) Semp., . 51
Hondurasensis (Fiss.) Rve., 146
Hondurasensis (*Fiss.*) Rve., 201
Humilis (Fiss.) Mke., . 161
Humphreyi (Fiss.) Rve., . 167
Huttoni (Hal.) Fil., . . 108
Huzardi (Emarg.) Payr., . 249

Ima (*Fiss.*) Greg., . . 206
Imbricata (Emarg.) Ad., . 277
Imbricata (*Fiss.*) Sby., . 217
Imbricata (Stomatella) Lam., ... 9
Imbricatus (*Parmoph.*) Q., 290
Impedimentum (Glyphis) Cooke, ... 292
Inæqualis (Glyphis) Sby., . 215
Incarnata (Fiss.) Kr., . 186
Incii (*Fiss.*) Rve., . . 219
Incisa (Hal.) Rve., . . 87
Incisura (Emarg.) Ad., . 265
Iridescens (Broderipia) Br., 46
Indusica (*Fiss.*) Rve., . 218
Intensa (Fiss.) Pils., . . 165
Intermedius (*Parmoph.*) Rv., 290
Interrupta (*Hal.*) Val., .
Iris (Hal.) Martyn, . . 110
Irisata (Stomatella) Dufo., 23
Italica (Glyphis) Defr., . 210
Intermedia (Tug.) Rve., . 285

Jacnensis (Hal.) Rve., . 89
Jamaicensis (Patella) Gm., 164
Janus (Hal.) Rve., . . 93
Japanicensis (Fiss.) Lm., . 188
Japonica (Emarg.) Sow., . 264
Japonica (Hal.) Rve., . 87
Japonica (Stomatella) Ad., 20
Japonicus (*Parmoph.*) Tap.-Can., ... 290
Japonicus (Sciss.) Ad., . 59
Jousseaumi (Hal.) Mab., . 291
Jukesii (Glyphis) Rve., . 208

Kamtschatkana (Hal.) Jonas, ... 85
Koeneni (Sciss.) Semp., . 51

Lacuniformis (Schismope) Wats., ... 63
Lævicostalis (Scutellina) Ad., ... 130
Lævis (*Emarg.*) Recl., . 253
Lævis (Gena) Pse., . . 41

Digitized by Google

Lævicostata (Emarg.) Ad., 268
Lævigata (Sciss.) Orb., . 50
Laqueare (*Emarg.*) Gray, . 274
Lamberti (Emarg.) Souv., . 281
Lamellatus (Sciss.) Ad., . 59
Lamellosa (Hal.) Lam., . 86
Lanceolata (Glyphis) Sby., 221
Larva (*Fiss.*) Rve., . . 212
Lata (Emarg.) Q., . . 282
Lata (Fiss.) Sowb., . . 147
Latemarginata (Fiss.) Sowb., ... 153
Lateralis (Addisonia) Req., 139
Latereplicata (*Fiss.*) Monts., 211
Latilabris (Hal.) Ph., . 125
Latiora (*Fiss.*) Sowb., . 220
Lauta (Hal.) Rve., . . 119
Legrandia Bedd., . . 294
Lentiginosa (*Fiss.*) Rve., . 200
Lentricula (Gena) Ad., . 44
Leptalea (Cocc.) Ver., . 133
Lilacina (Fiss.) Costa, . 171
Lima (Glyphis) Sby., . 220
Limbata (Fiss.) Sow., . 149
Limatula (Fiss.) Rve., . 198
Limatula (Lucapinella) Rve., ... 198
Lineata (Gena) Ad., . . 45
Lineata (Glyphis) Sby., . 219
Lirata (Stomatia) Ad., . 33
Listeri (*Emarg.*) Ant., . 274
Listeri (Glyphis) Orb., . 206
Longifissa (Emarg.) Sow., . 258
Longifissa (Fiss.) Sowb., . 163
LUCAPINA Gray, . 178, 181
Lucapina H. & A. Ad., . 203
LUCAPINA Gray. . . 198
LUCAPINELLA Pils., . 179, 195
Lyrata (Stomatella) Pils., . 12
Lutea (Gena) Ad., . . 44

Macrochisma Sw., . . 189
Macroschisma (Fiss.) Chem., 192
Macroschisma (Fiss.) Sby., . 193
MACROSCHISMA Sw., . 178, 189
Macrotrema (Fiss.) Sow., . 159
Maculata (Emarg.) Ad., . 263
Maculata (*Emarg.*) Souv., . 263
Maculata (Hal.) Küst., . 103
Maculata (Stomatella) Q. & G., ... 13
Magnifica (Emarg.) Pils., . 251
Malukana (Stomatella) Ad., 14
Mamillata (*Fiss.*) Risso, . 206
Mantelli (Sciss.) Woodw., . 54
Mariæ (Hal.) Gray, . . 111
Margaritana (Stomatella) Ad., ... 22
Mariei (Rimula) Cr., . 271
Mariei (Stomatella) Cr., . 15
Marmorata (Hal.) Costa, . 86
Marmorata (Hal.) Gray, . 106
Marmorata (Hal.) Sowb., . 93
Maxima (Fiss.) Sby., . 145
Maxima (Macroschisma) Ad., ... 192
Mazatlanica (Rimula) Cpr., 272
Mediterranea (*Fiss.*) Gray, 211
MEGATEBENNUS Pils., 178, 182
Megatrema (Fissurellidea) Orb., ... 179
Megatrema (Macroschisma) Ad., ... 193
Megathura Californica Nutt., ... 182
Melvilli (Fiss.) Sowb., . 174
Menkeana (Glyphis) Dk., . 222
Metcalfi (Fiss.) Rve., . . 212
Mexicana (Fiss.) Sowb., . 153
Micans (Emarg.) Ad., . 257
Microtina Ads., . . . 35
MICROTIS Ad., . . 7, 35
Microtrema (Fiss.) Sowb., . 162
Midæ (Hal.) L., . . 112
Minima (Stomatella) Dufo, 23
Minor (*Fiss.*) Mar., . . 206
Minuta (*Fiss.*) Costa, . 222
Minuta (Glyphis) Lm., . 223
Miranda (Sciss.) Ad., . 67
Mirificus (Sciss.) Ad., . 60
Miriga (*Fiss.*) Greg., . 293
Modesta (Sciss.) Ad., . 67
Modesta (Stomatella) Ad., 23
Modesta (Subemarg.) Ad., 284
Mouchezi (Schismope) Vél., 62

Digitized by Google

Monilifera (Fiss.) Sowb., . 162
Monilifera (Lucapina), . 227
Monilifera (Stomatella) Ad., 14
Montrouzieri (Emarg.) Souv., ... 265
Montrouzieri (Stomatella) Pils., ... 27
Montaguana (*Cemoria*) Leach, ... 206
Morleti (Schismope) Cr., . 62
Mucronata (*Fiss.*) Monts., . 206
Mülleri (*Emarg.*) F. & H., 253
Multiperforata (Hal.) Rve., 115
Multistriata (Emarg.) Jeff., 252
Munieri (Sciss.) Fischer, . 54
Muricata (Fiss.) Rve., . 156
Mutabilis (Fiss.) Sow., . 171

Nævosa (Hal.) Dh., . . 116
Nævosa (Hal.) Mart., 116, 291
Nana (Punct.) Ad., . . 293
Natalensis (Fiss.) Kr., . 173
Naufraga (Zeidora) Wats., 247
Nebulata (Hal.) Rve., . 102
Nebulosa (Gena) Ad., . 42
Neglecta (*Fiss.*) Dh., . . 211
Neglecta (Hal.) Phil., . 86
Nesta (Emarg.) Pils., . 269
NESTA H. Ad., . . 249, 269
Nigra (Fiss.) Less., . . 149
Nigra (Fiss.) Ph., . . 147
Nigra (Gena) Ad., . . 39
Nigra (Gena) Q. & G., . 38
Nigra (Stomatella) Anton, 23
Nigrita (Fiss.) Sowb., . 137
Nigriradiata (*Fiss.*) Rve., . 217
Nigrocincta (Fiss.) Cpr., . 160
Nigrooccellata (*Fiss.*) Rve., [205, 207
Nigropunctata (Fiss.) Sowb., [158, 159
Nimbosa (Fiss.) L., . . 163
NIPHONIA Ad., . . 6, 29
Nitidissima (Broderipia) Dh., ... 48
Noachina (Punct.) L., . 229
Nobilis (Punct.) Ad., . 231
Nodosa (Fiss.) Born., . 164
Nodosa (Hal.) Phil., . . 81
Nodulosa (Emarg.) Ad., . 281
Notata (Subemarg.) L., . 282
Notata (Stomatella) Ad., . 19
Novæcaledoniæ (Macroschisma) Sowb., . . 194
Novæzeelandiæ (Hal.) Mart., 102
Nubecula (Fiss.) L., . . 170

Obliqua (Sciss.) Wats., . 58
Oblonga (Fiss.) Mke., . 292
Oblonga (*Tug.*) Pse., . . 287
Obovalis (Fiss.) Less., . 158
Obovata (Emarg.) Ad., . 267
Obscura (Fiss.) Sowb., . 163
Obscura (Stomatia) Sow., . 31
Obscurata (Stomatia) Lam., 31
Obtusa (Fiss.) Sow., . . 173
Occidens (Fiss.) Gld., . 155
Occitanica (Fiss.) Recl., . 206
Octagona (*Fiss.*) Rve., . 205
Octoradiata (*Emarg.*) Sby., 278
Octoradiata (Subemarg.), 273
Oldhamiana (Emarg.) Nev., 277
Olivacea (Fiss.) Gray, . 174
Omicron (Fiss.) C. & F., . 174
Orbiculata (Stomatella) Ad., ... 16
Orbignyi (*Padollus*) Costa, 50
Oriens (Fiss.) Sowb., . . 152
Ornata (Fiss.) Nutt., . . 156
Ornata (Gena) Ad., . . 45
Ornata (Stomatella) Braz., 26
Ornatissima (Stomatella) Pils., ... 26
Ossea (*Tug.*) Ad., . . 287
Ostrina (Fiss.) Rve., . . 160
Ovina (Hal.) Chem., . . 124
Oxia (Punct.) Wats., . . 235

PADOLLUS Montf., . 75, 120
Paivana (*Semperia*) Cr., . 253
Pallida (Stomatella) Ad., . 20
Pallida (Stomatia) Can., . 34
Panamensis (Glyphis) Sby., 216
Panhi (*Emarg.*) Q., . . 277
Panhiensis (*Emarg.*) Ad., . 277
Papillosa (Emarg.) Risso, . 250

Digitized by Google

Papillosa (*Fissurisepta*) Seg., ... 244
Papillosa (Punct.) Seg., . 244
Papyracea (Stomatella) Ch., 10
Papilionacea (Emarg.) Nev., 279
Papulata (Hal.) Rve., . 97
Paradoxa (Addisonia) Dall, 139
Parma (*Hal.*) Val., . . 291
Parmophoidea (Tug.) Q., . 285
Parmophoroidea (Tug.) Ad., ... 285
Parmophoridea (Tug.) Sby., 285
Parmophorus Blainv., . 287
Parva (Hal.) L., . . 120
Parva (Hal.) Risso, . . 86
Parviperforata (Fiss.) Sow., 293
Patelloideus (*Parmoph.*) Cantr., ... 290
Patagonica (Glyphis) Orb., 213
Paucicostata (Sciss.) Jeffr., 52
Pelex (Punct.) Ad., . . 241
PEROTROCHUS Fisch., . 70
Pertusa (Hal.) Rve., . . 101
Peruviana (Fiss.) Lm., . 155
PHANETA Ad., . . 6, 30
Philippiana (*Fiss.*) Dkr., . 222
Philippiana (Fiss.) Rve., . 146
Philippii (Fiss.) Req., . 171
Phymotis (Stomatia) Helb., 30
Pica (*Fiss.*) Sby., . . 215
Picta (Fiss.) L., . . 144
Picta (Stomatella) Montr., 27
Picta (Stomatella) Orb., . 29
Picta (Subemarg.) Dkr., . 284
Pileata (Emarg.) Gld., . 284
Pileus (Fiss.) Sw., . . 175
Pileum (*Emarg.*) Heilpr., . 275
Pileolus (*Emarg.*) Mich., . 254
Pileolus (Punct.) Ad., . 241
Pileopsoides (Fiss.) Rve., . 175
Pileopsides (Fiss.) Sowb., . 175
PLAGIORHYTIS Fisch., . 273
Planata (Hal.) Sowb., . 99
Planilirata (Hal.) Rve., . 81
Plantarum (*Emarg.*) Dufo, 261
Planulata (Emarg.) Ad., [264, 269
Planulata (Gena) Lm., . 38
Plagiorhitis Fisch., . . 283
PLEUROTOMARIA Sowb., . 69
PLEUROTOMARIIDÆ, . . 69
Plicata (Sciss.) Phil., . 50
PLOCAMOTIS Fisch., 7, 37, 40
Plumbea (Gena) Ad., . 39
Polygonatis (Emarg.) Ad., 281
Polygona (Fiss.) Sow., . 148
PONDEROSA (Hal.) Ad., . 82
Porphyrozonias (Patella) Gm., ... 165
Pourtalesii (Hal.) Dall., . 121
Producta (Macroschisma) Ad., ... 194
Profundi (Punct.) Jeff., . 243
Princeps (*Punct.*) Mig., . 230
Propinqua (Rimula) Ad., . 271
Proxima (Glyphis) Sby., . 220
Pulchella (Niphonia) Ad., 29
Pulchella (Scutellina) Lisc., 128
Pulchella (Stomatella) Ad., 28
Pulcherrima (Hal.) Mart., . 124
Pulchra (Emarg.) Ad., . 282
Pulchra (Fiss.) Sow., . 151
Pulchra (Schismope) Pet., . 68
Pumila (*Emarg.*) Ad., . 275
Punctata (Emarg.) Ad., . 263
Punctatissima (Fiss.) Pils., 150
Puncticulata (Emarg.) Ad., 262
PUNCTURELLA Lowe, 202, 228
Pupillia Gray, . . . 180
PUPILLÆA Kr., . . 178, 180
Pusilla (Cocc.) Jeff., . . 136
Pustula (Fiss.) Lm., . . 176
Pustula (Patella) Linn., . 176
Pustulata (Hal.) Rve., . 100
Pustulifera (Hal.) Pils., . 96
Pustulosa (Hal.) Weink., . 101

Quamosa (Hal.) Weink., . 112
Quoyana (Pleurotomaria) F. & B., . . . 70

Radiata (Emarg.) Gld., . 284
Radiata (*Tug.*) Ad., . . 287
Radiosa (Fiss.) Less., . 157
Rathbuni (Cocc.) Dall, . 132
Recurvata (*Fiss.*) Costa, . 206

Digitized by Google

Redimicula (Fiss.) Say. . 213
Retecosa (Emarg.) Ad., . 259
Reticosa (*Emarg.*) Sowb., . 260
Reticulata (*Emarg.*) Sowb., 253
Reticulata (*Fiss.*) Don., . 206
Reticulata (Hal.) Rve., . 86
Reticulata (Sciss.) Phil., . 51
Reticulata (Zeidora) Ad., . 247
Revelata (Hal.) Dh., . . 102
RIMULA Defr., . . 202, 270
Rimuloides (Schismope), . 68
Robusta (Fiss.) Sowb., . 292
Roedingi (Hal.) Mke., . 112
Roei (Hal.) Gray, . . 117
Rollandi (Emarg.) Fisch., 274
Rosacea (*Fiss.*) Ant., . . 292
Rosacea (Gena) Pse., . 41
Rosacea (Hal.) Rve., . 93
Rosea (Broderipia) Brod., . 47
Rosea (Emarg.) Bell, . 254
Rosea (Fiss.) Gm., . . 166
Rosea (Fiss.) Phil., . . 171
Rosea (Patella) Gm., . 165
Roseoradiata (Macroschisma) T.-W., . . 191
Rota (Fiss.) Rve., . . 172
Rostrata (Punct.) Seg., . 245
Rotundata (Hal.) Perry, . 126
Ruber (Hal.) Leach, . 111, 291
Rubicundus (Hal.) Rve., . 123
Rubicundus (Padollus) Montf., ... 123
Rubiginosa (Fiss.) Hutt., [216, 291
Rubiginosa (Hal.) Rve., . 94
Rubra (*Emarg.*) Lm., . 264
Rubra (Stomatia) Lam., . 33
Rubroflammulata (Stomatella) Pilsbry, . . 24
Rubropicta (Fiss.) Pils., . 161
Rudis (Clypidina) Ad., . 283
Rufescens (Hal.) Sw., . 82
Rufescens (Stomatella) Gray, ... 17
Rugosa (Emarg.) Q., . 278
Rugosa (Fiss.) Sow., . . 161
Rugosa (Hal.) Rve., . . 102
Rugosa (Hal.) Weink., . 87
Rugosa (Subemarg.) H. Ad., 284
Rugosoplicata (Hal.) Chem., 110
Rumphii (Pleurotomaria) Schepm., . . . 71
Rüppeli (*Parmoph.*) Ph., . 290
Ruppellii (Glyphis) Sby., . 217

Sagittata (Fiss.) Rve., . 172
Salebrosa (Glyphis) Rve., . 208
Sanguinea (Hal.) Han., . 114
Sanguinea (Stomatella) Ad., 18
Sayi (Fiss.) Dall, . . 212
Scabricosta (Hal.) Mke., . 118
Scabricostata (Emarg.) Ad., 268
Scabriuscula (Emarg.) Ad., 268
SCHISMOPE Jeffr., . 49, 60
Schizotrochus Monts., . . 49
Schrammi (Fiss.) Fisch., . 165
Scissa (*Patella*) Salis, . 249
SCISSURELLA Orb., . . 49
SCISSURELLIDÆ, . . 49
Scitula (Stomatella) Ad., . 15
Scobinata (Scutellina) Gld., 129
Scrobiculata (Fiss.) Nev., . 227
Sculpta (Fiss.) Pils., . . 167
Sculptilis (Emarg.) . . 280
Scutella Brod., . . . 46
Scutella (Fiss.) Sowb., . 188
Scutella Brod., . . . 127
Scutellaris (Tug.) Ad., . 280
Scutellata (Emarg.) Dh., . 261
SCUTELLINA Gray, . . 127
SCUTELLINIDÆ Dall, . 127
Scutellum (Fiss.) Gm., . 184
Scutiformis (Macroschisma) Nev., ... 195
Scutulum (Hal.) Rve., . 101
Scutum Auct., . . . 287
SCUTUS Montf., . . 203, 287
Secernenda (Hal.) Monts., . 86
Selecta (Stomatella) Ad., . 17
Sella (Fiss'idea) Sowb., . 185
Semiplicata (Hal.) Mke., . 126
Semistriata (Hal.) Rve., 95, 96
Semperia Crosse, . 248, 253
Sepiculata (Hal.) Rve., . 87
Sieboldii (Glyphis) Rve., . 204
Sieboldii (Hal.) Rve., . 84, 85

Digitized by Google

Sicula (*Emarg.*) Gray, . 251
Similis (Glyphis) Sow., . 208
Sinensis (Macroschisma) Ad., ... 190
Sinensis (*Parmoph.*) Blv., . 290
Singaporensis (Glyphis) Rve., ... 219
Sinuata (Hal.) Perry, . 126
Sipho Brown, . . . 228
Solidula (Emarg.) Costa, . 255
Souverbiana (Emarg.) Pils., 262
Spadicea (Hal.) Kr., . . 115
Speciosa (Hal.) Rve., . 92
Speciosa (Stomatella) Ad., 19
Spinigera (Cocc.) Jeffr., . 135
Spinosa (Emarg.) Dh., . 262
Spinosa (Patella) Gm., . 164
Splendens (Hal.) Rve., . 81
Splendidula (Stomatia) Ad., 34
Spongiosa (Fiss.) Cpr., . 157
Sportella (Punct.) Wats., . 235
Squamata (Hal.) Rve., . 91
Squamosa (Hal.) Gray, . 112
Squamulifera (Fiss.) B. D. D., ... 171
Stamineus (Sciss.) Ad., . 60
Stellata (Emarg.) . . 283
Stellata (Fiss.) Rve., . . 148
Stellata (Stomatella) Souv., 25
STOMATELLA Lam., . 6, 7
STOMATELLIDÆ, . . 5
STOMATIA Lam., . 6, 30
Stomatiæformis (Hal.) Rve., 89
Stomatiidæ, . . . 5
Striata (Hal.) Linn., . . 86
Striata (Hal.) Rve., . . 94
Striatula (Emarg.) Q., . 259
Striatula (Gena) Ad., . 40
Striatula (Sciss.) Phil., . 50
Strigata (Hal.) Weink., . 103
Strigosa (Gena) Ad., . 39
Subclathrata (Emarg.) Pils., 266
SUBEMARGINULA Bl., 202, 273
Subiridescens (Broderipia) Pils., ... 46
Subrotunda (Fiss.) Dh., . 155
Subrostrata (Glyphis) Sby., 213
Subvirginea (Hal.) Weink., 108
Suffusa (*Fiss.*) Rve., . . 201
Sulcifera (Emarg.), . . 283
Sulcifera (Stomatella) Lam., 11
Sulcosa (Hal.) Phil., . . 118
Sulculus Ads., . . . 75
Supertexta (Hal.) Lischke, 116
Supraplicata (Sciss.) Smith, 54
Squamosa (Fiss.) Hutt., . 216
SYNAPTOCOCHLEA Pils., . 6, 25

Tabulata (Schismope) Wats., 62
Tæniata (Fiss.) Sow,, . 172
Tanneri (Glyphis) Ver., . 213
Tasmaniæ (Macroschisma) Gray, ... 192
Tasmaniæ (Macroschisma) Sowb., ... 191
Tasmaniæ (Emarg.) Sby., . 278
Tasmanica (Legrandia) Bedd., ...
Tasmanica (Macroschisma) T.-W., ... 191
Tasmanica (Tug.), . . 287
Tasmanica (Zeidora) Bedd.,
Tasmaniensis (Fiss.) Bonn., 188
Tayloriana (Hal.) Rve., . 105
Tectum-persicum (*Fiss.*) Costa, ... 211
Tegula (*Glyphis*) Rve.. . 226
TEINOTIS Ads., . . 75, 126
Tenebrosa (Fiss.) Sowb., . 160
Tenuis (*Emarg.*) Recl., . 253
Tenuis (Sciss.) Jeffr., . 53
Tenuicostata (Emarg.) Sow., 260
Tenuistriata (Glyphis) Sow., 220
Textilis (Emarg.) Gld., . 284
Thomasi (Emarg.) Crse., . 264
Ticaonica (Glyphis) Rve., . 225
Tigrina Stomatella) Ad., . 21
Tongana (Glyphis) Q., . 217
Trapezina (Amblychilepas) Sowb., ... 188
Trapezina (Fiss.) Sowb., . 188
Triangulata (Punct.) Dall., 245
Tricarinata (Emarg.) Born, 276
Tricostata (Emarg.) Sby., . 274
Tricostalis (Hal.) Lm., . 123

Digitized by Google

Trifolium (Punct.) Dall, . 237
Trochotoma, . . . 67
Tubifera (Hal.) Lam., . 84
Tuberculata (Hal.) L., 85, 291
Tuberculata (Microtis) Ad., 35
Tuberculosa (*Emarg.*) Lib., 250
TUGALIA Gray, . . . 273
Tugalia Gray, . . . 284
Tugali Gray, . . . 284
Tumida (Stomatella) Gld., 10
Turbinatus (Sciss.) Ad., . 59

Umbilicata (Sciss.) Jeffr., . 52
Unguiformis (Scutellina) Gld., ... 129
Unguis (*Scutus*) Ad., . 288
Unguis (*Scutus*) Ad, . 289
Unguis (Scutus) Linné. . 289
Uniumbilicatus (Sciss.) Costa, ... 50
Unilateralis (Hal.) Lam., . 97

Vanikorensis (Emarg.) Q., 268
Varia (Hal.) L., . . 95
Varia (Hal.) Risso, . . 86
Varia (Gena) Ad., . . 45
Varicosa (*Fiss.*) Sowb., . 205
Variegata (Emarg.) Ad., . 263
Variegata (Glyphis) Sowb., 225
Variegata (Stomatia) Ad., 34
Venusta (*Fiss.*) Rve., . 218
Venusta (Hal.) Ad. & Rve., 91
Verrieri (Rimula) Cr., . 271
Verna (Fiss.) Gld., . . 168
Viminea (Emarg.) Ad., . 258
Viminea (Fiss.) Mke., . 161
Viminea (*Fiss.*) Rve., . 212
Violacea (Fiss.) Esch., . 149
Virginea (Hal.) Chem., . 107
Virginea (Hal.) Rve., . 93
Viridis (Fiss.) Costa, . 171
Viridis (Hal.) Rve., . 95, 96
Viridula (Glyphis) Lm., . 226
Virescens (Fiss.) Sowb., . 158
Vitoensis (*Fiss.*) Greg., . 293
Volcano (Fiss.) Rve., . 156
Vulgaris (Hal.) Blv., . 121
Vulgaris (Hal.) Da Costa, 86

Watsoni (Punct.) Dall, . 237
Weldii (Macroschisma) T.-W., ... 191
Woodwardia C. & F., . 60

Zealandica (Hal.) Rve., . 102
ZEIDORA Ad., . . 202, 246
Ziczac (Hal.) Rve., . . 106
Zidora Fisch., . . . 246

NOTE.—The parts of Volume XII of this MANUAL were issued to subscribers upon the following dates: Part 45, May 27, 1890; Part 46, August 12, 1890; Part 47, December 16, 1890; each part consisted of 64 pp. text and 15 plates.

Parts 21, 22, 23, of the 2d Series were issued upon the same dates.

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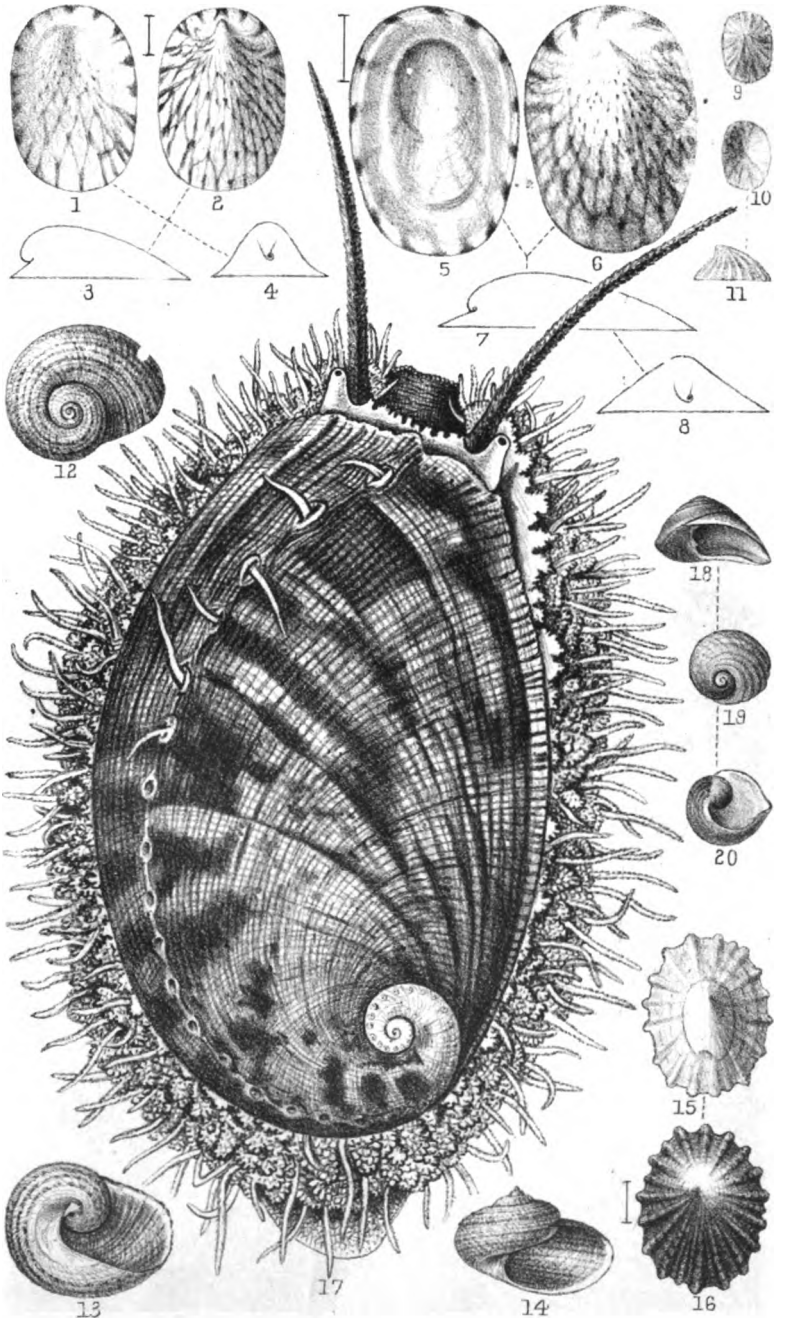

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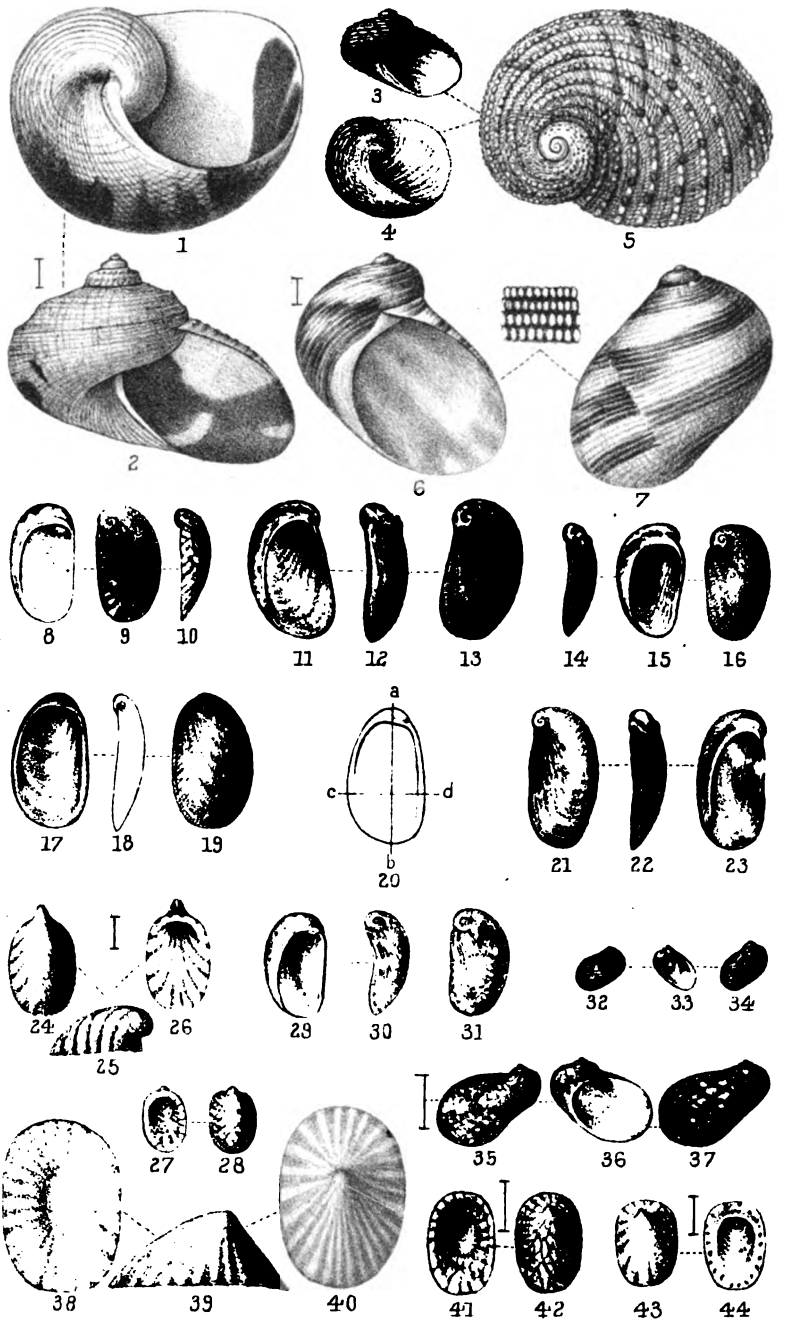

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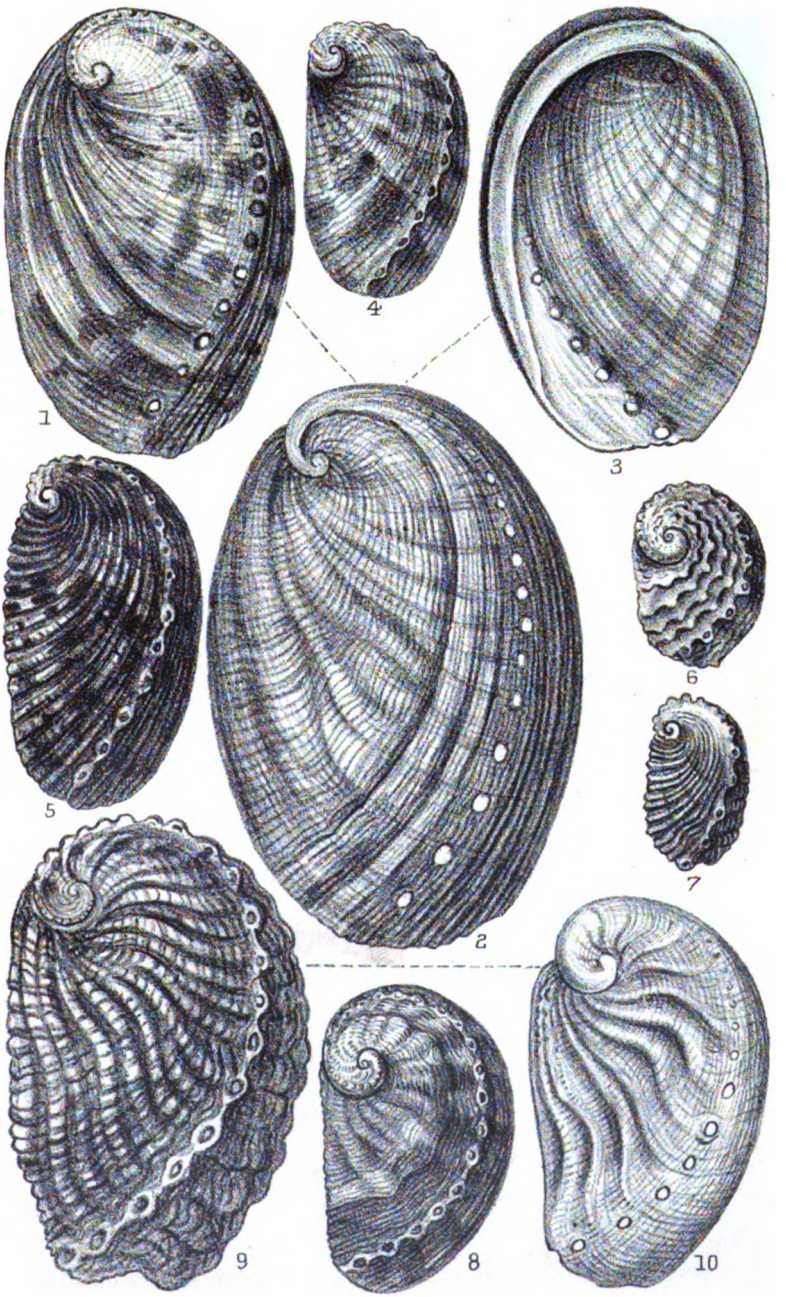

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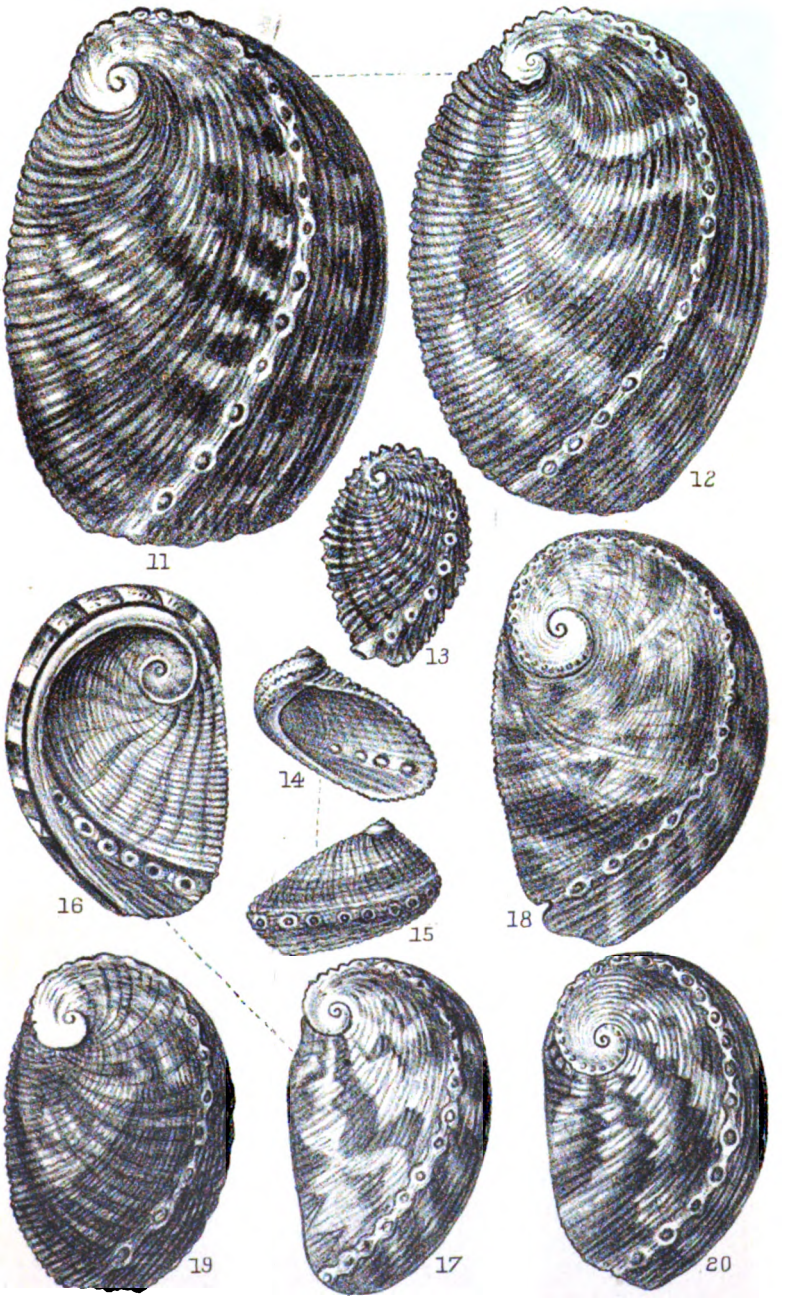

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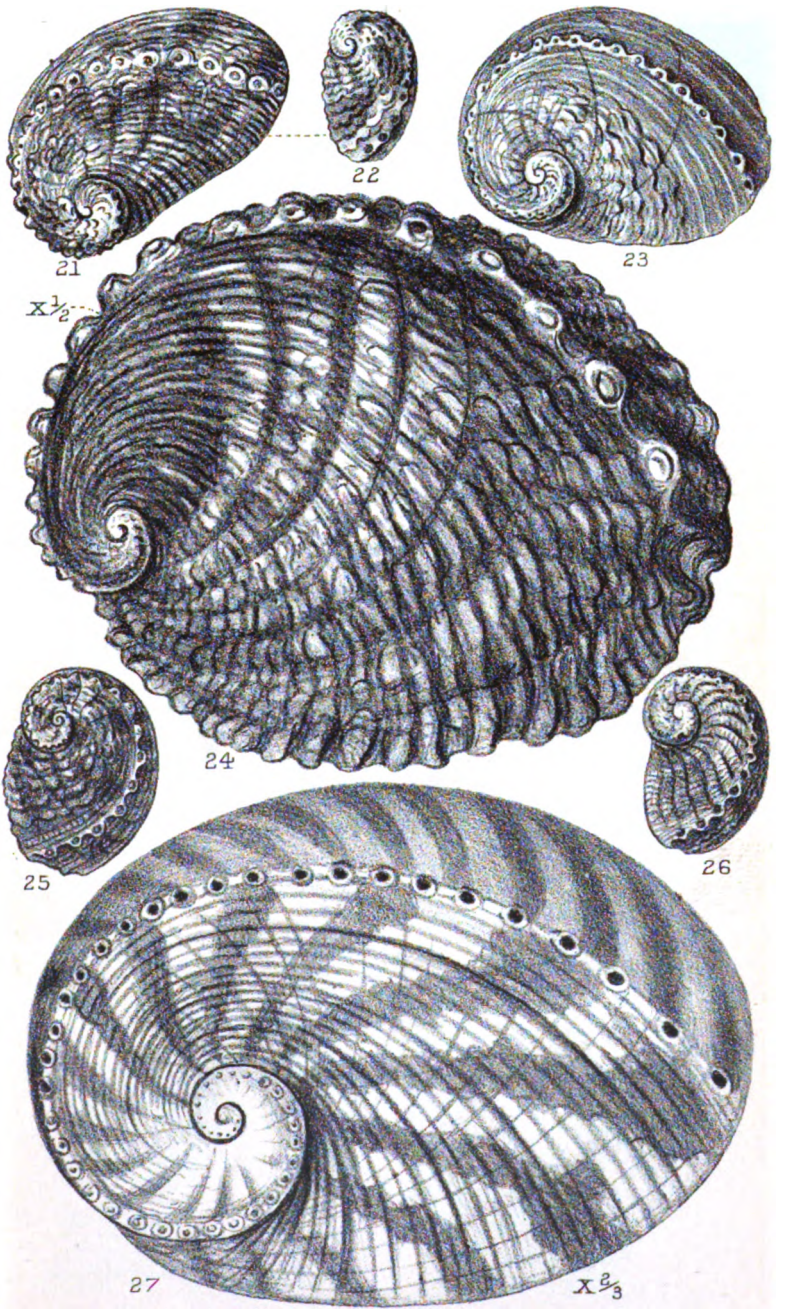

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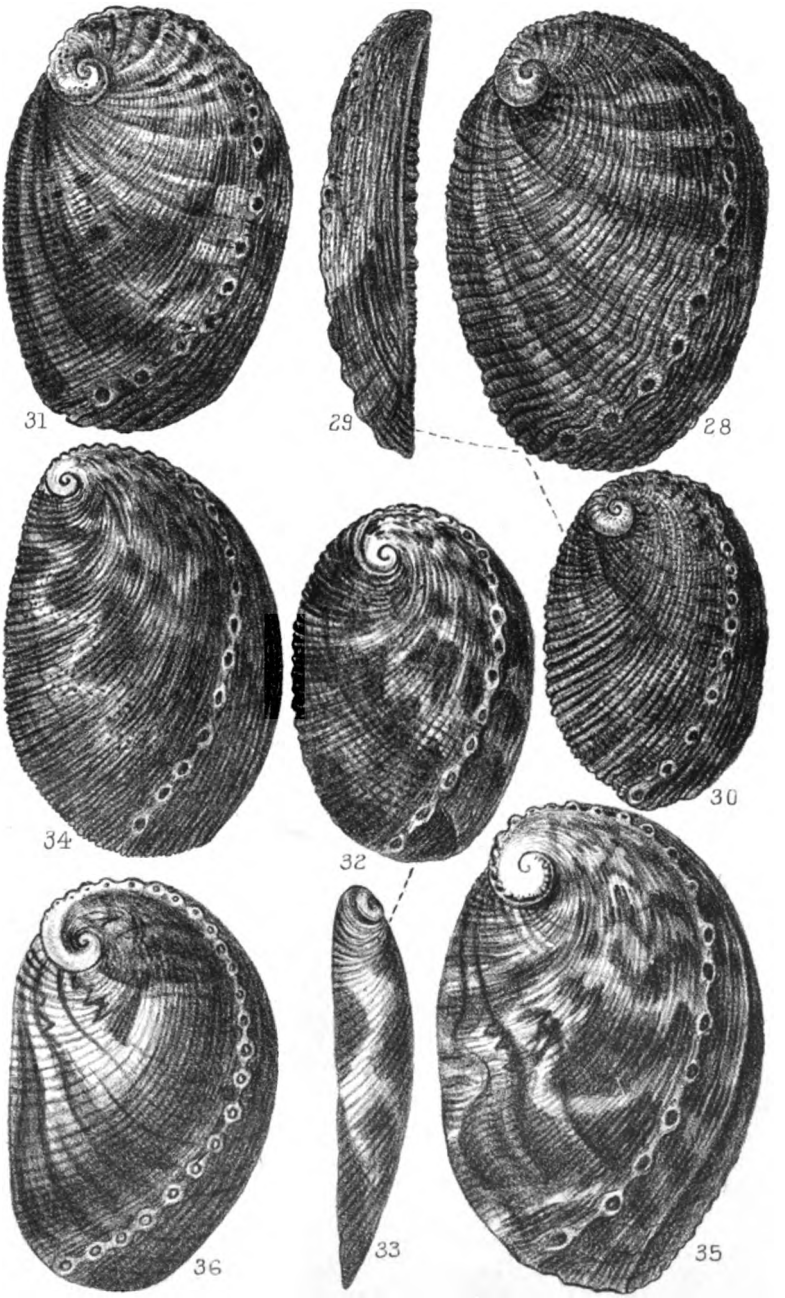

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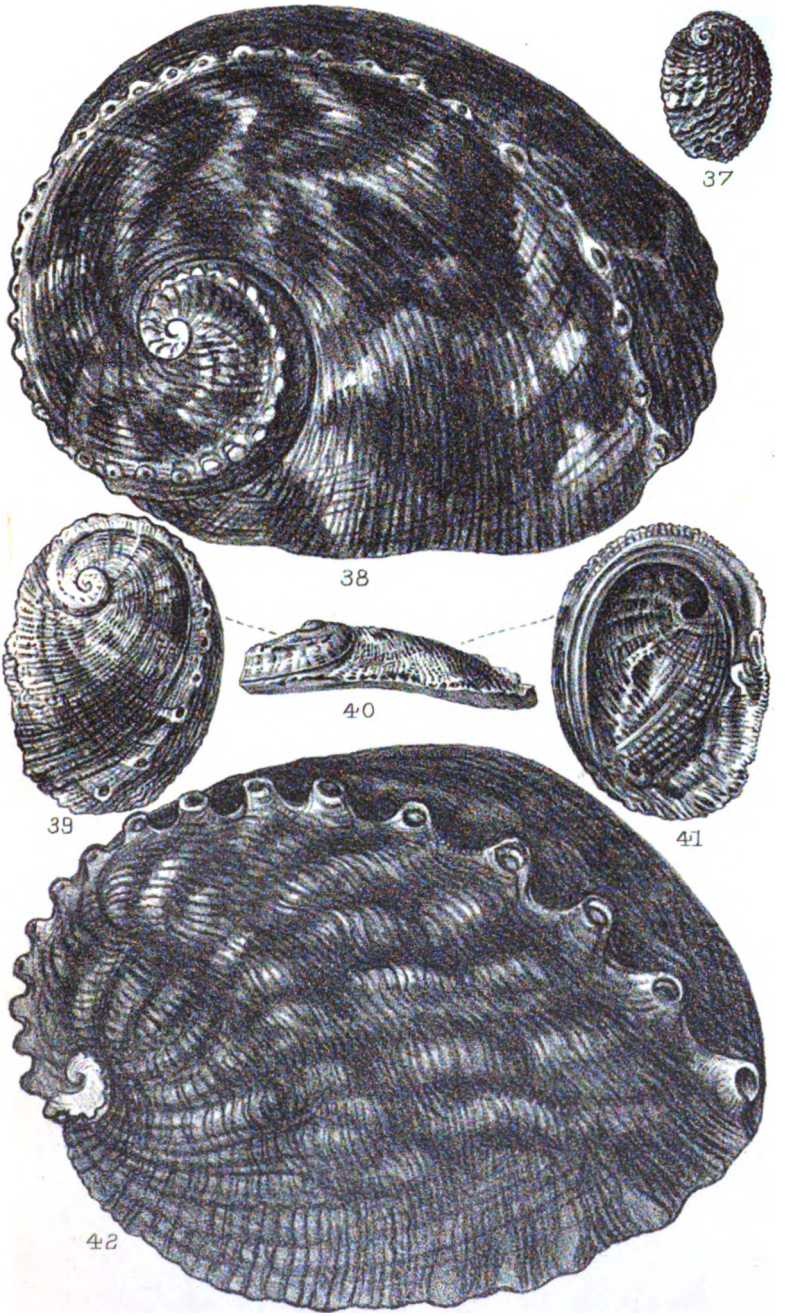

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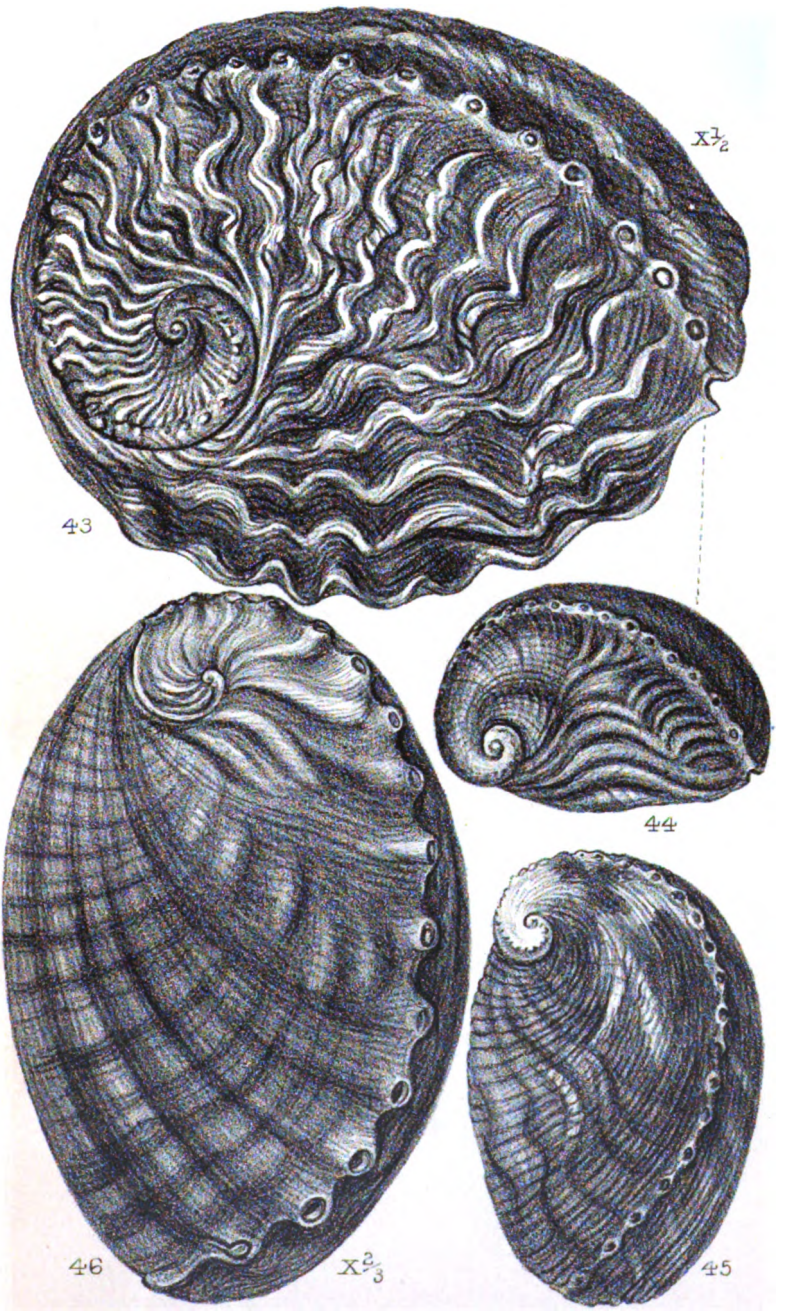

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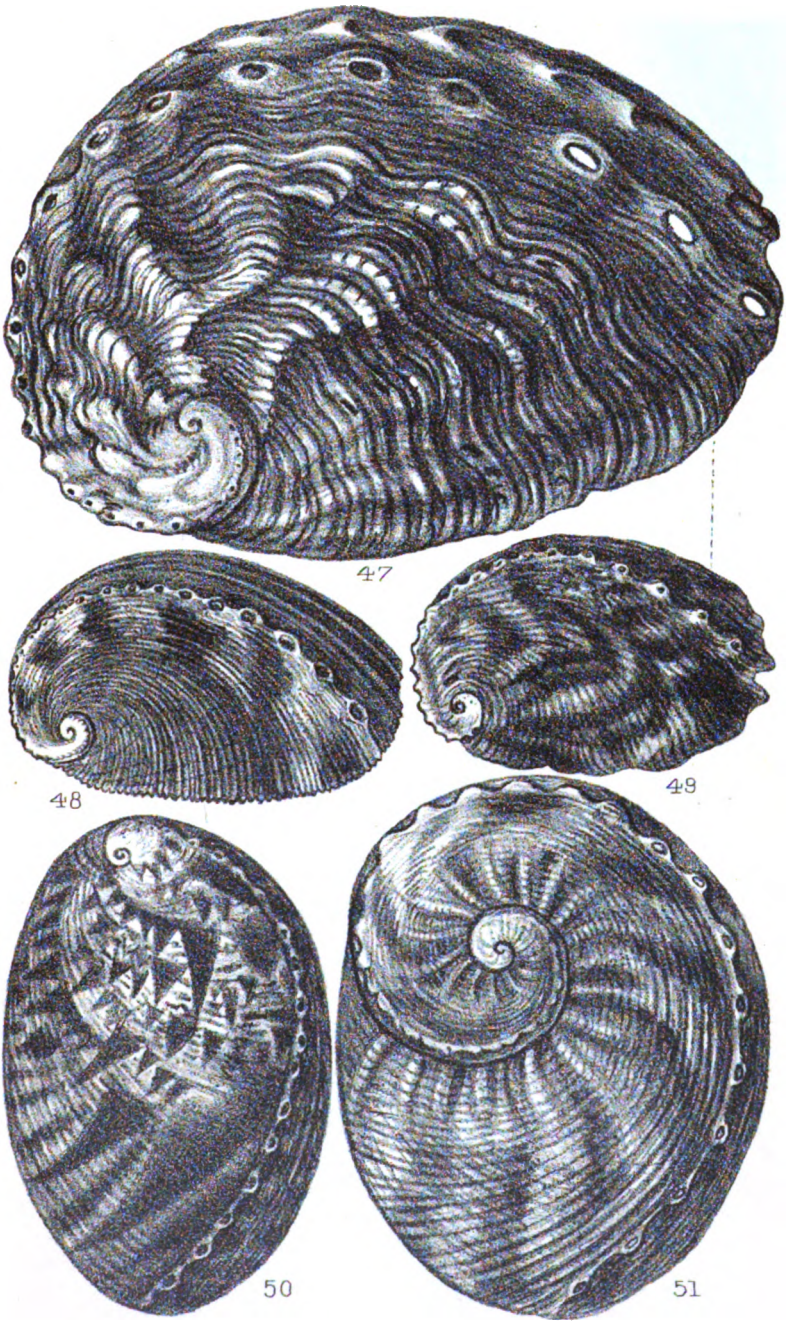

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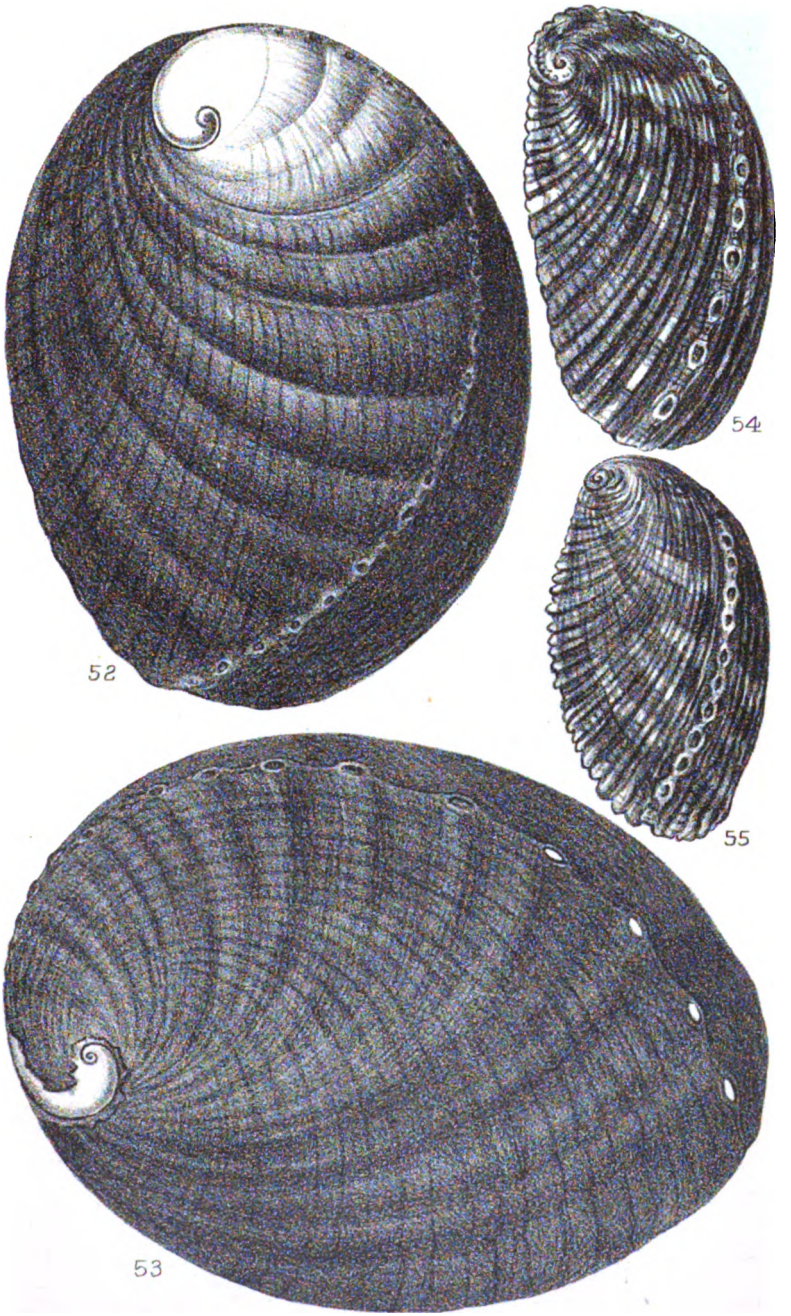

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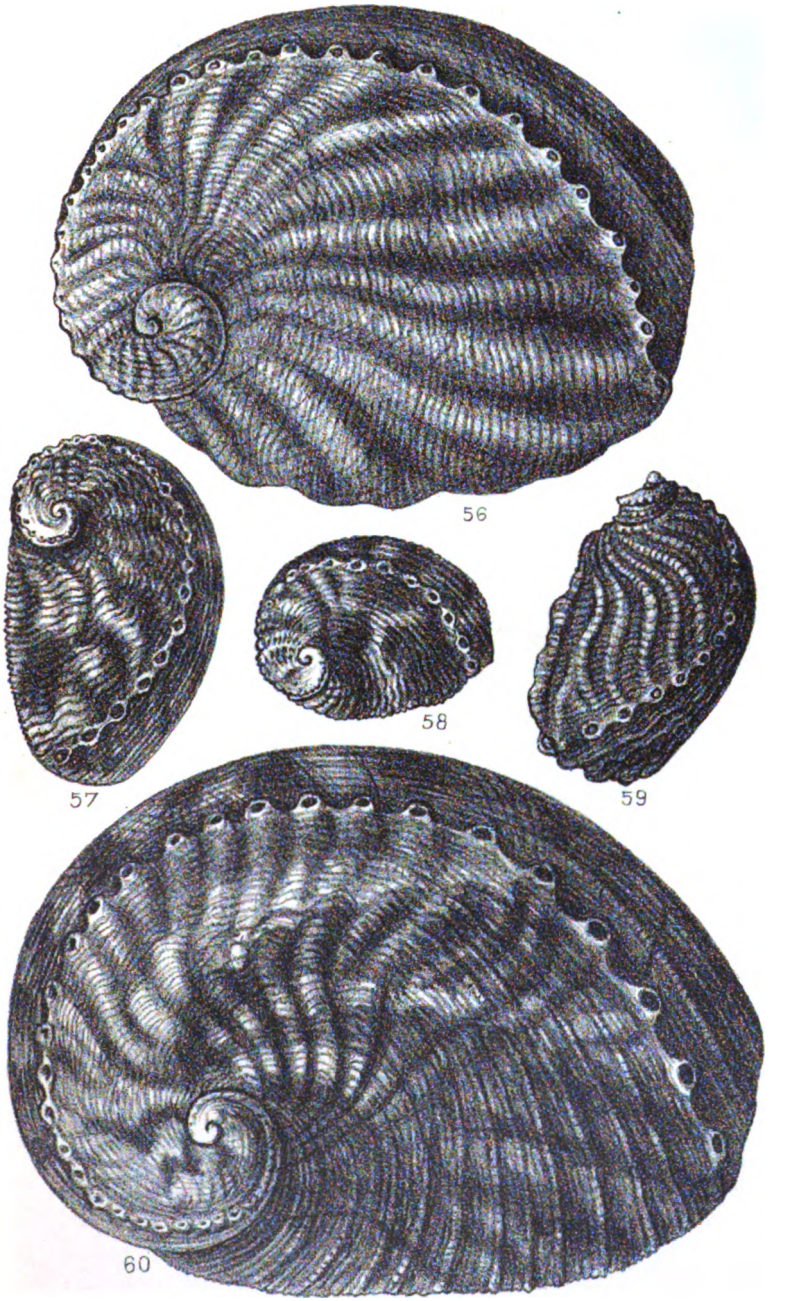

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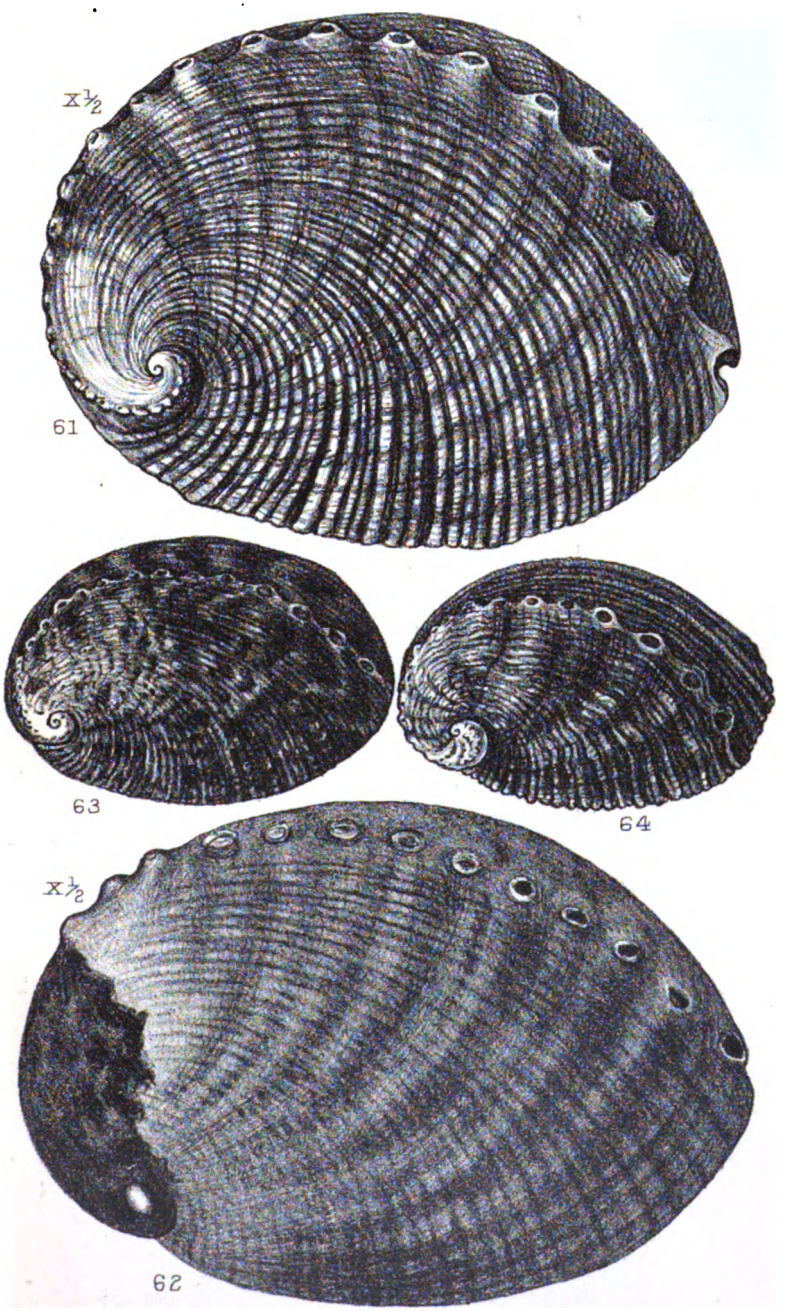

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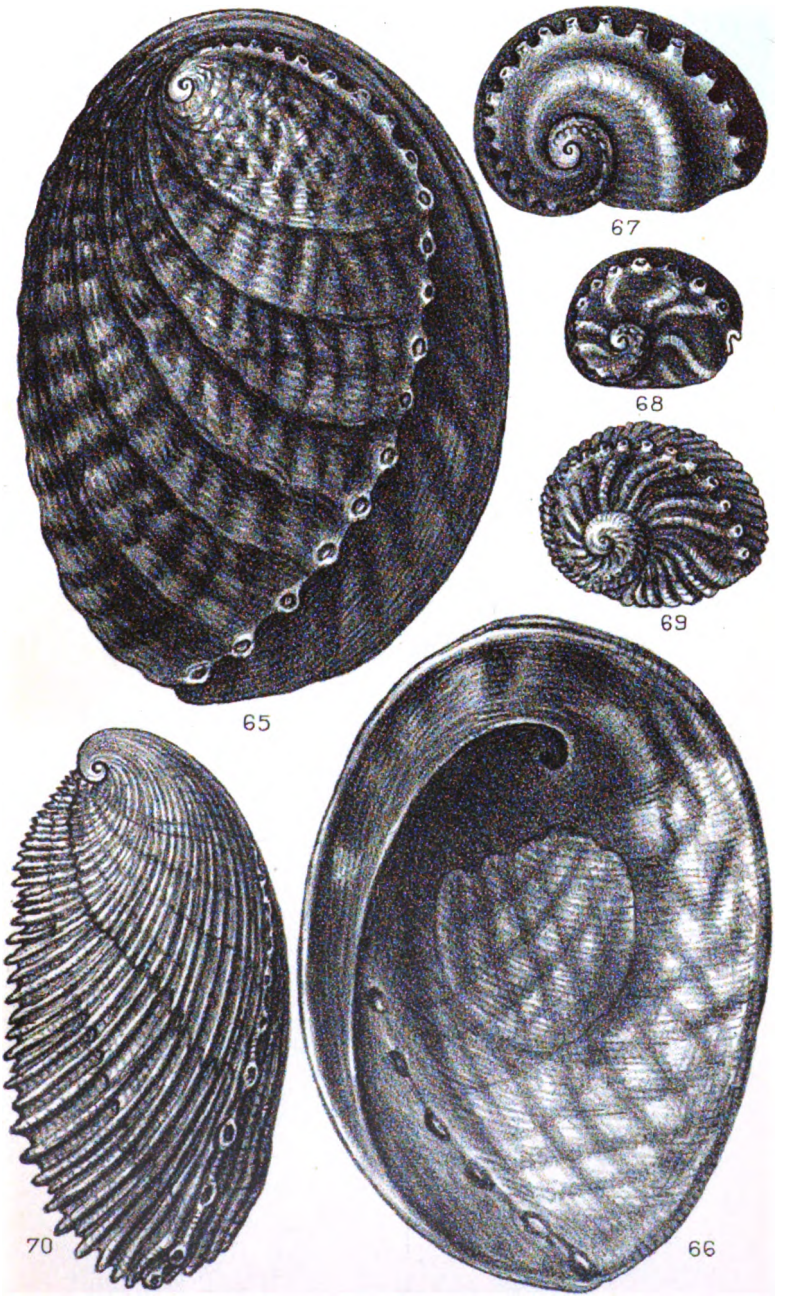

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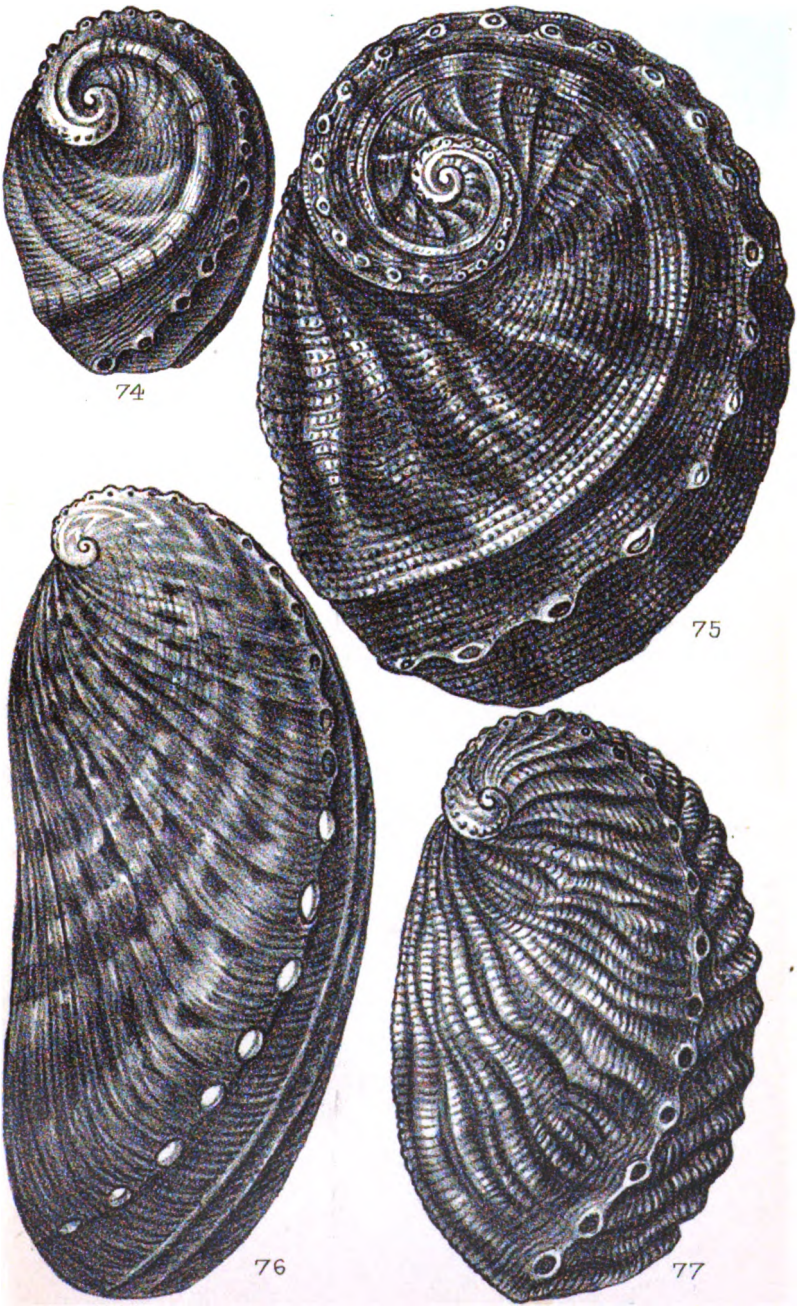

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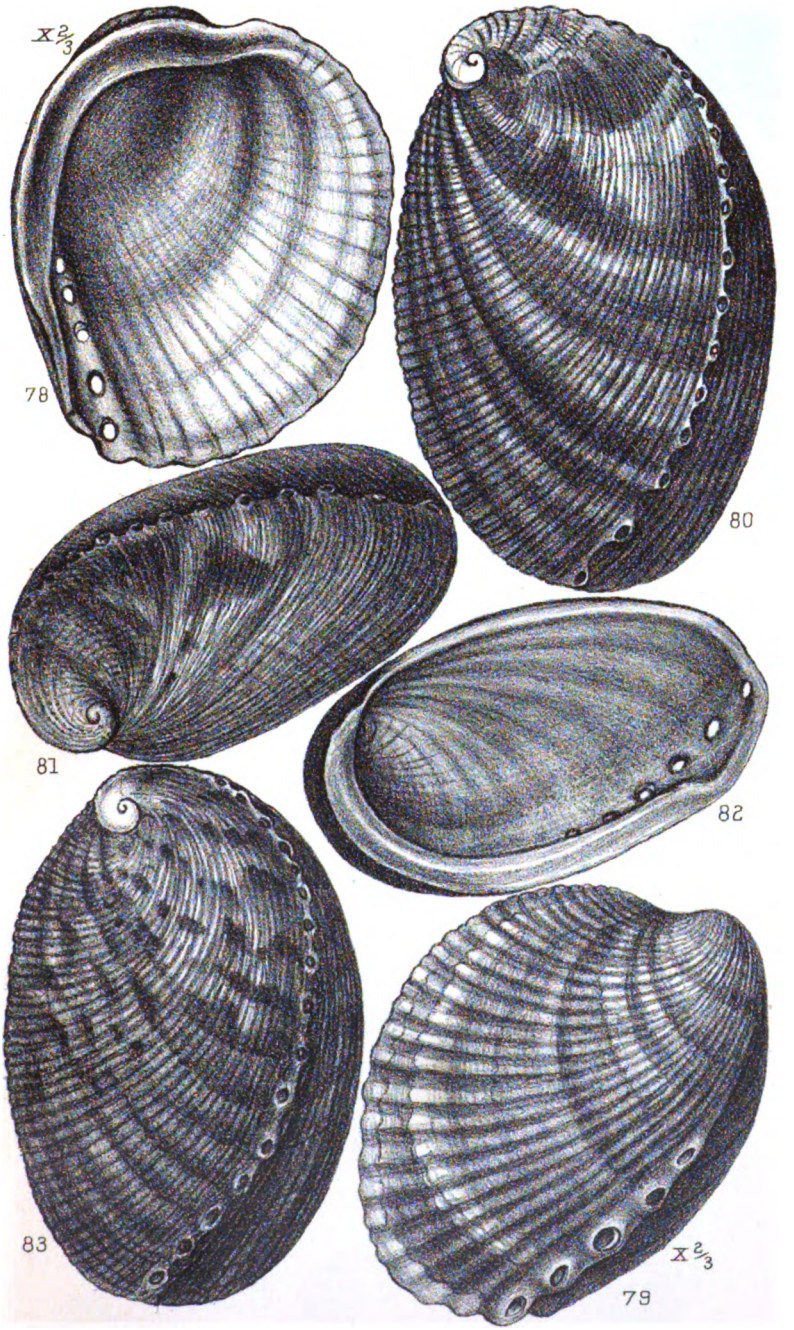

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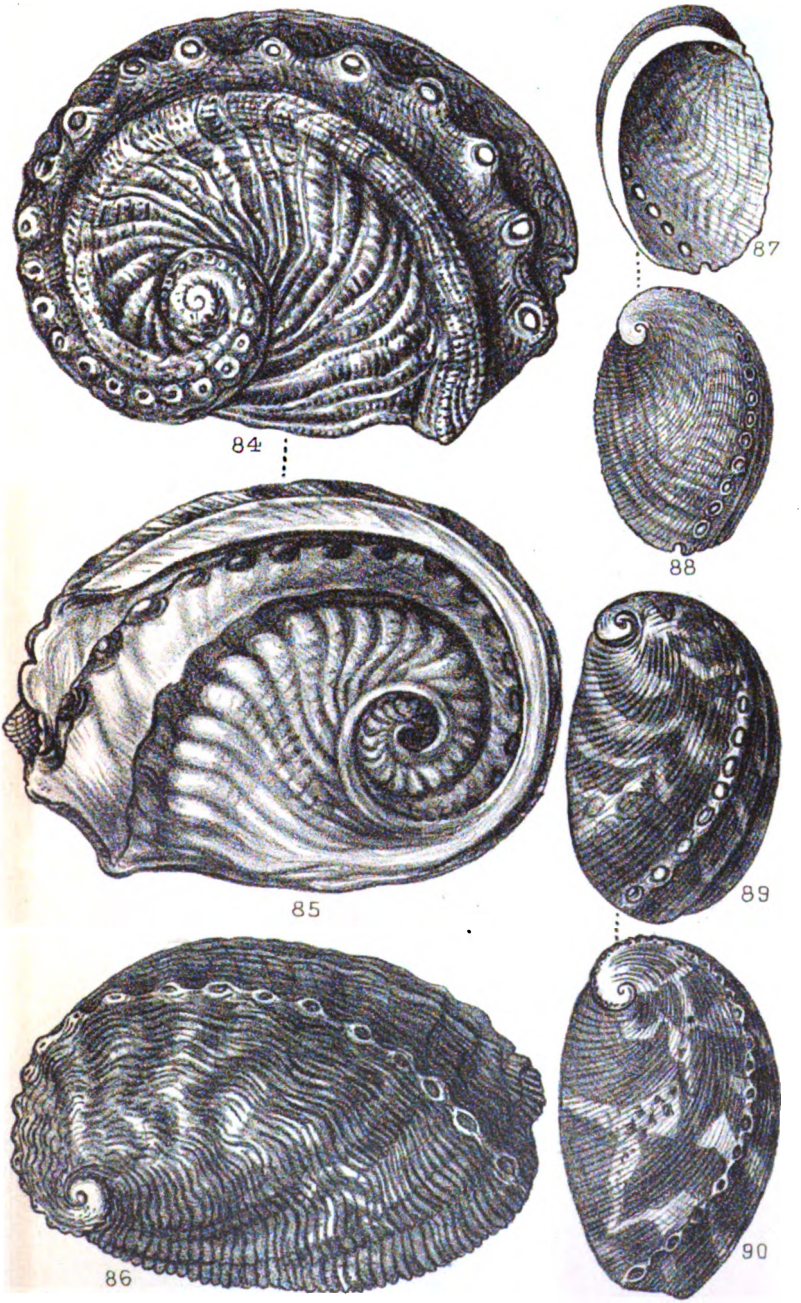

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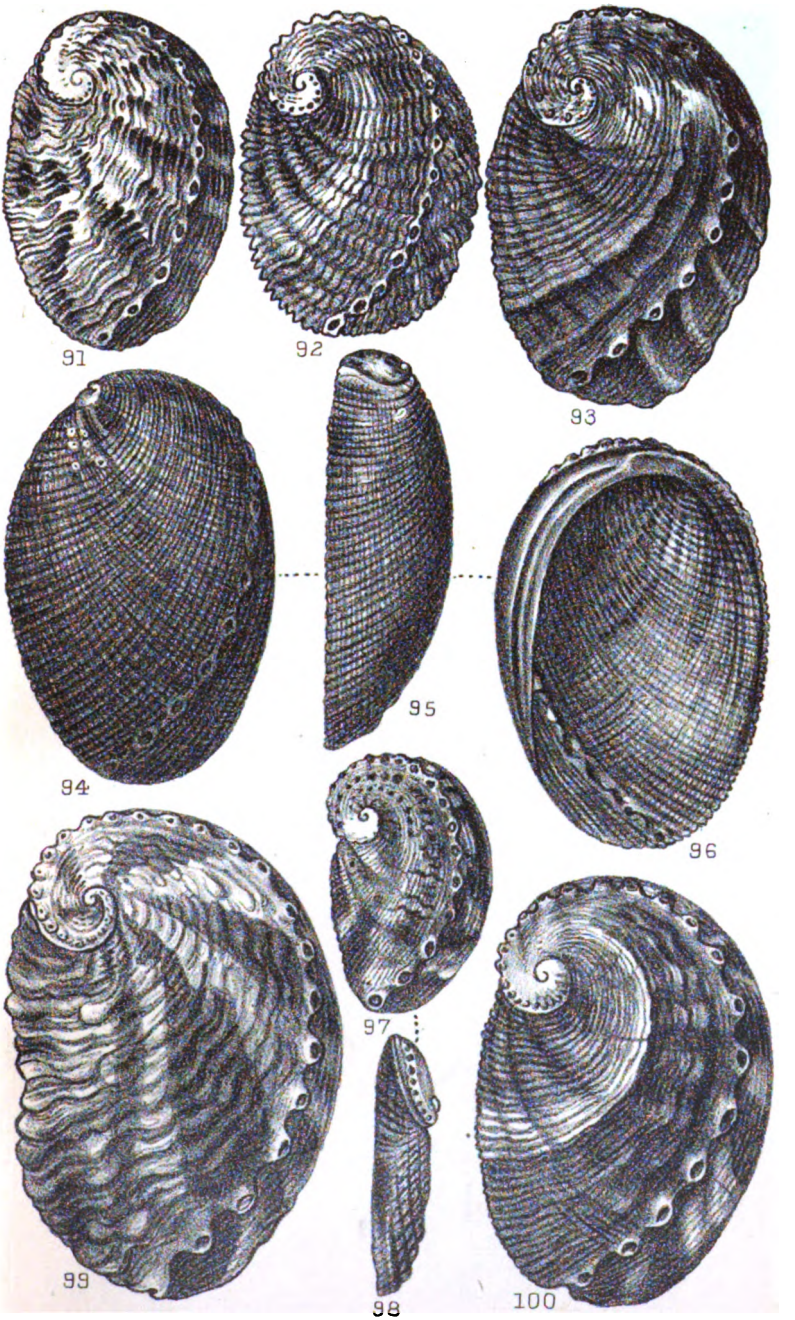

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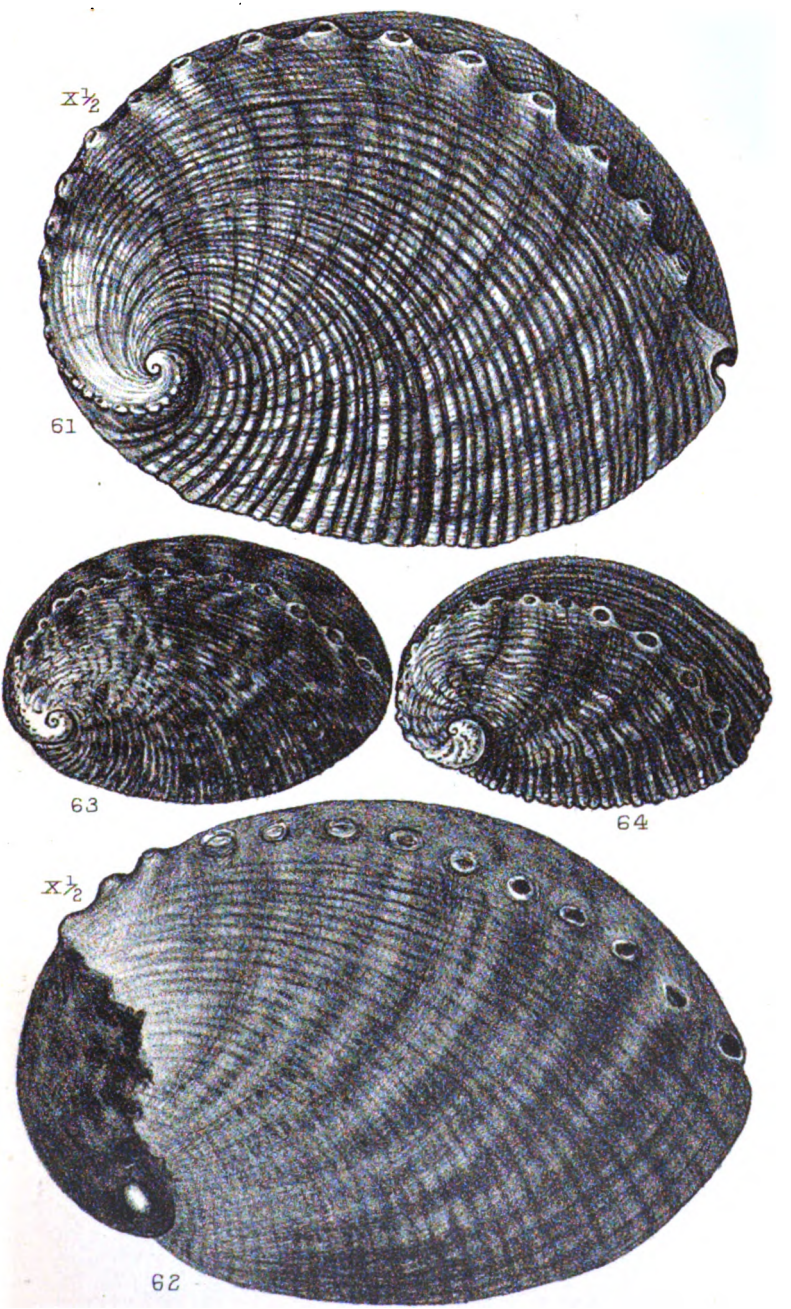

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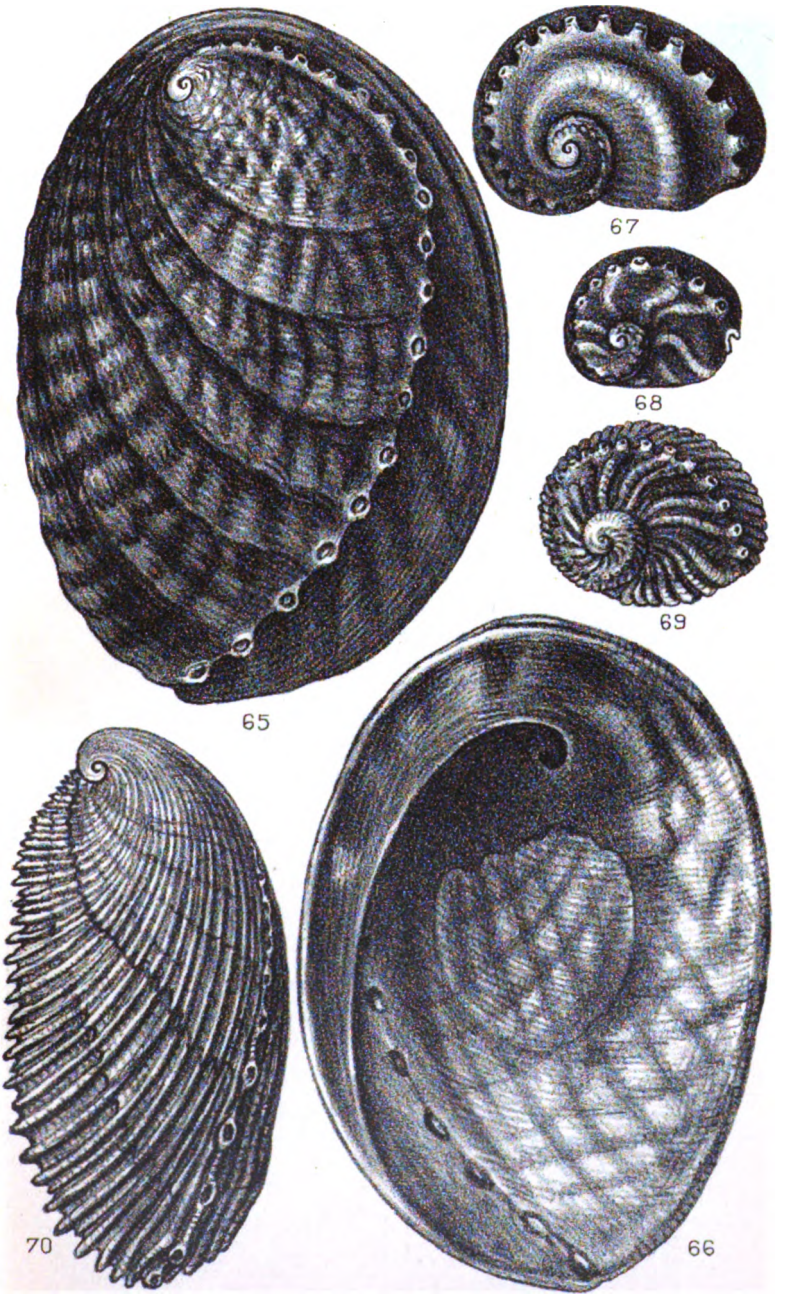

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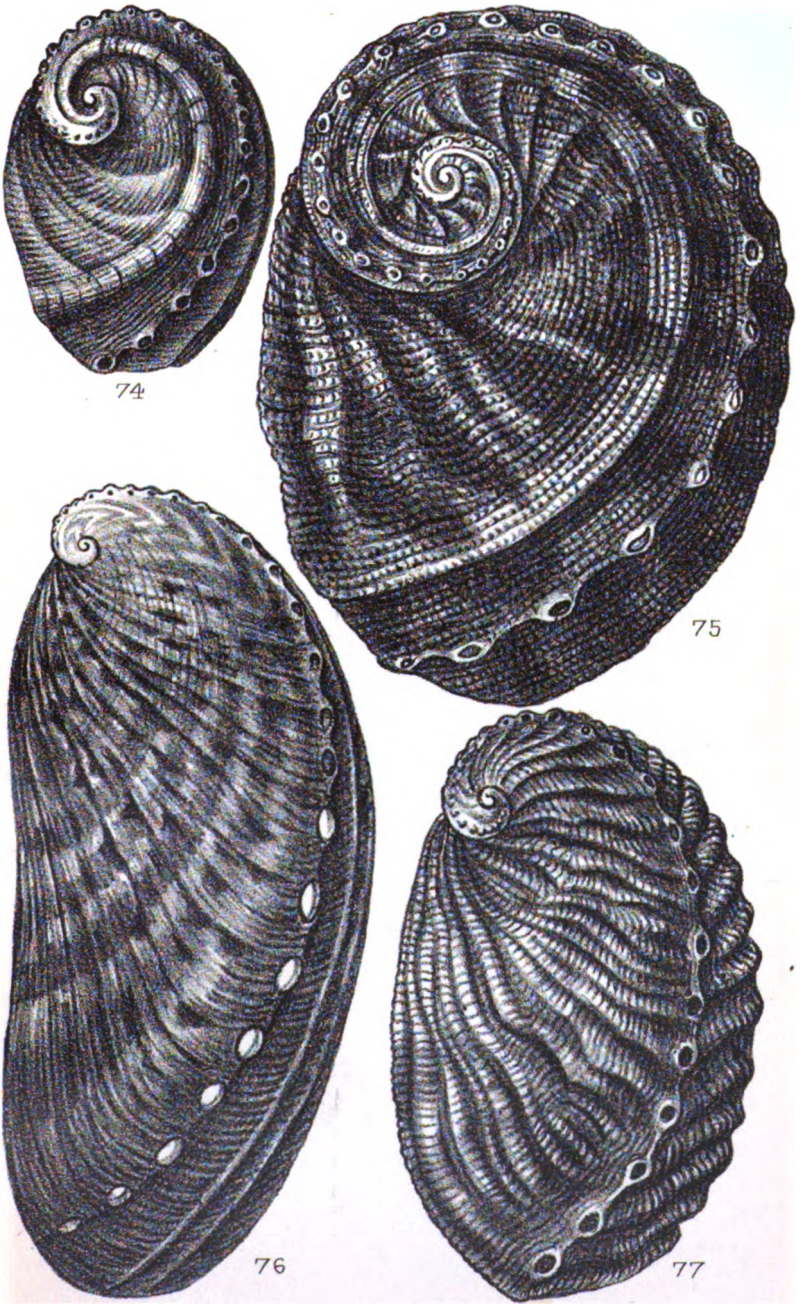

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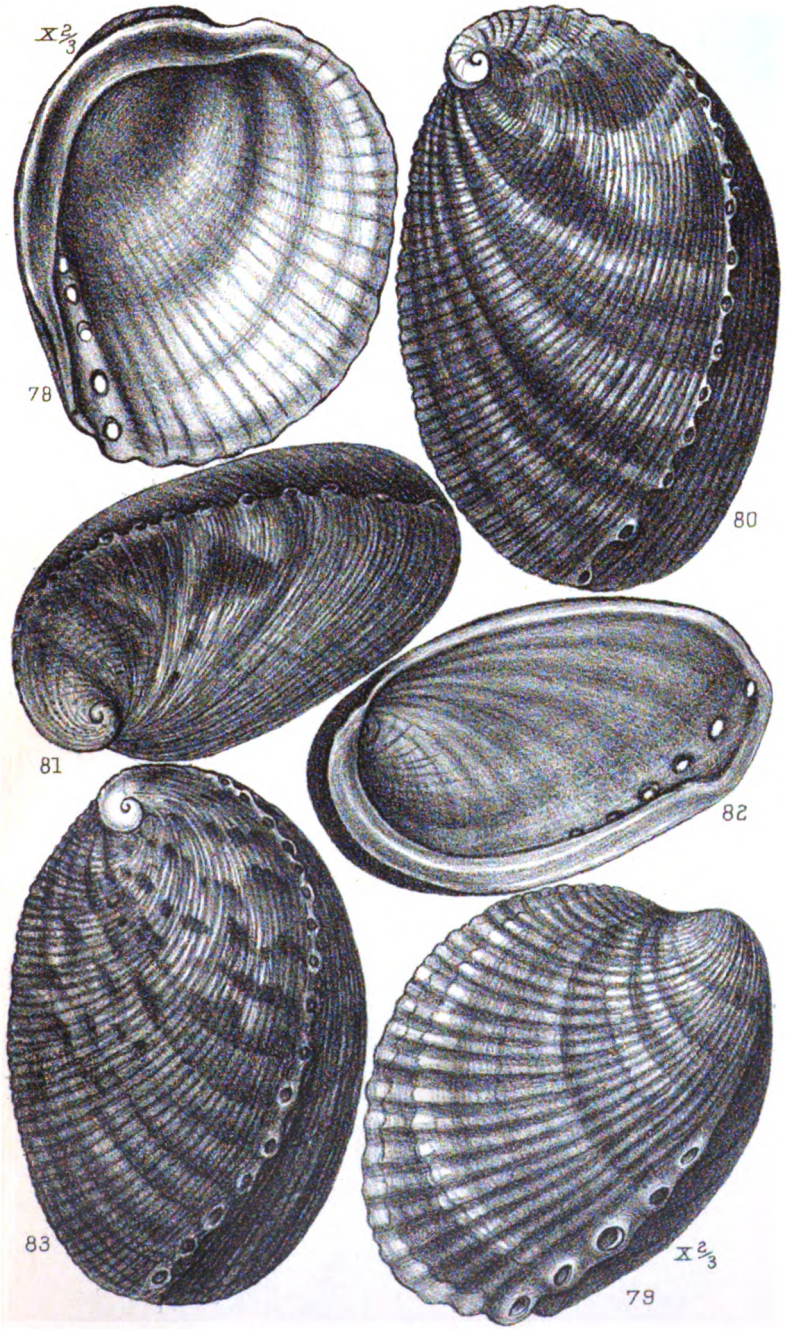

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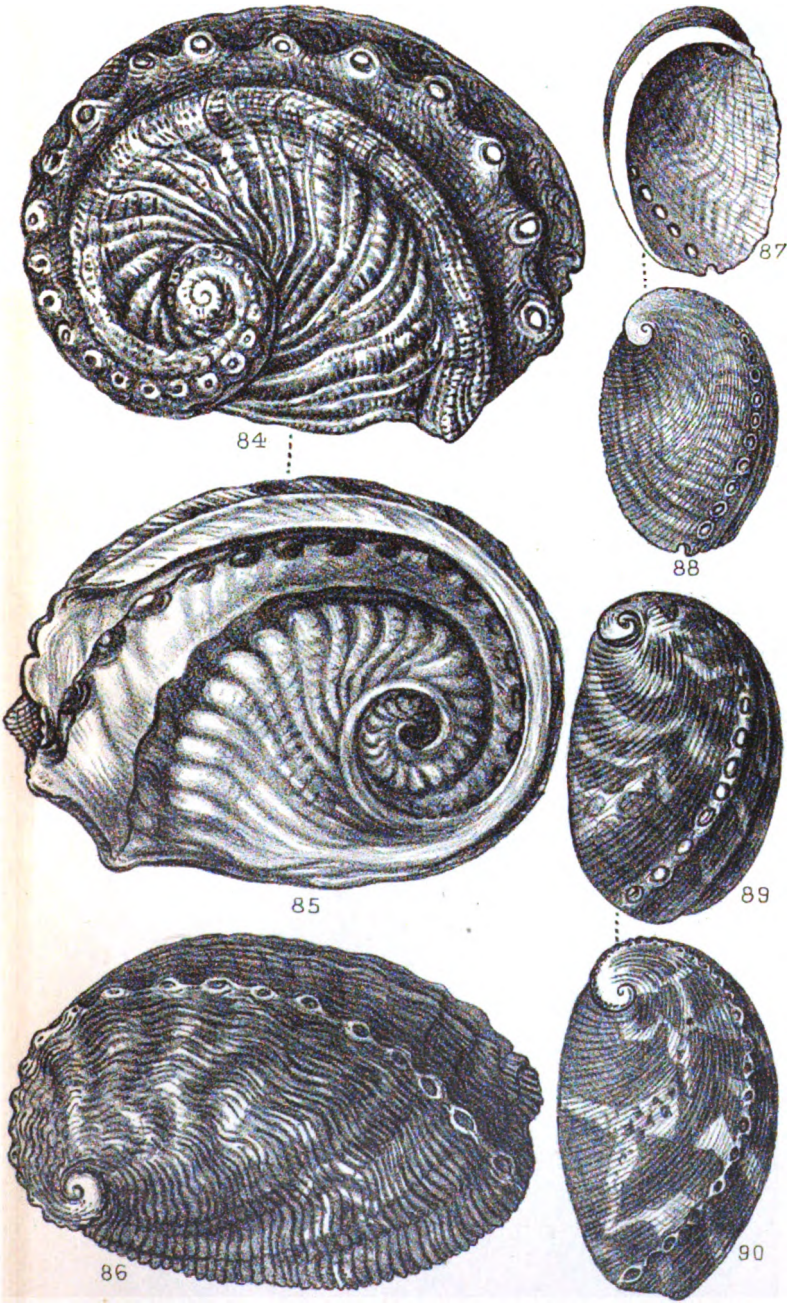

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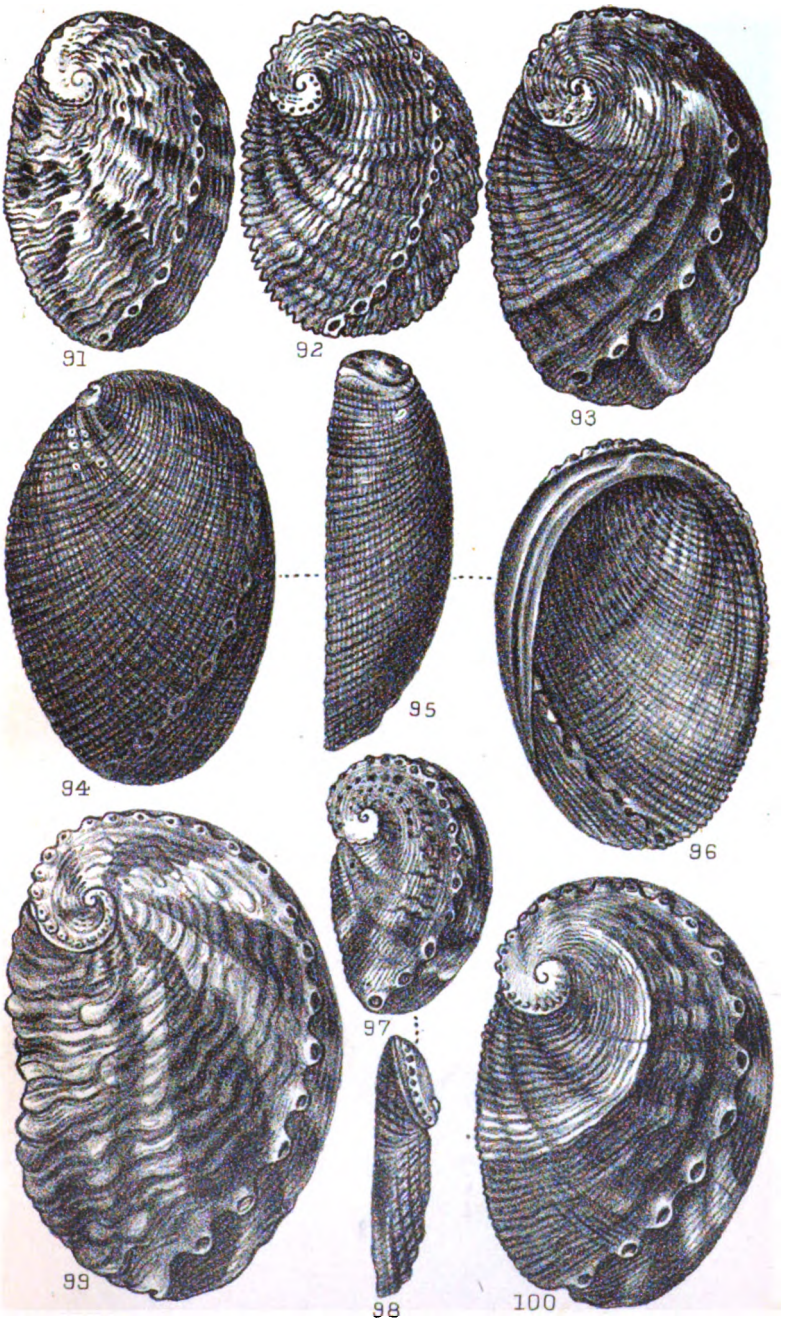

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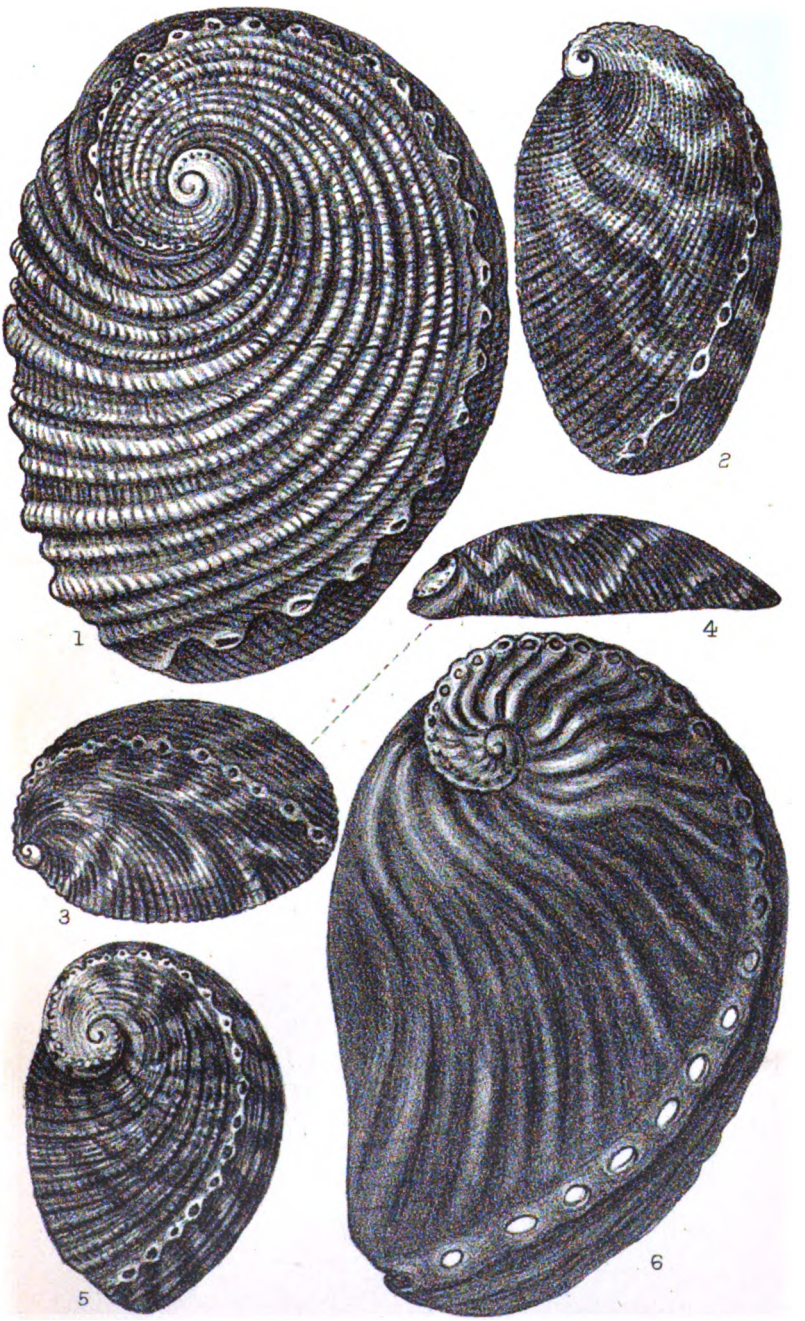

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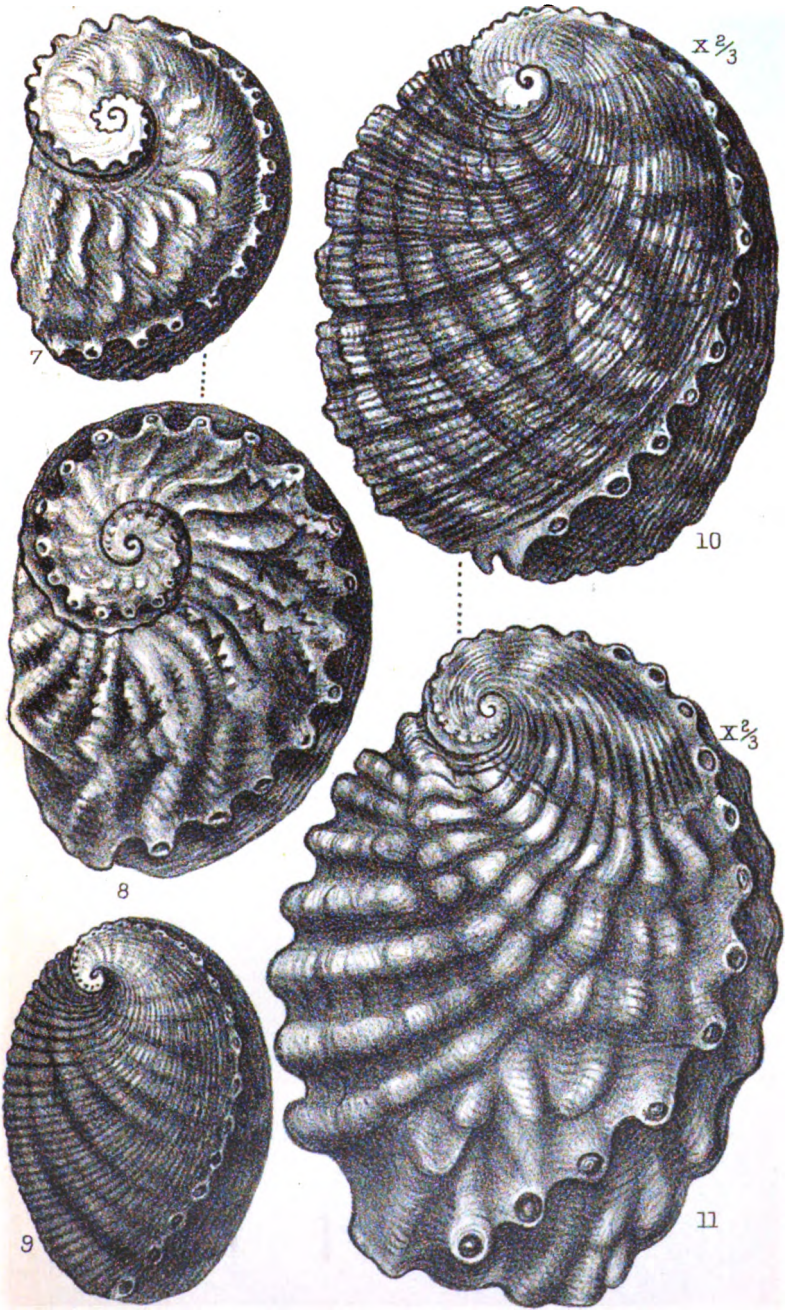

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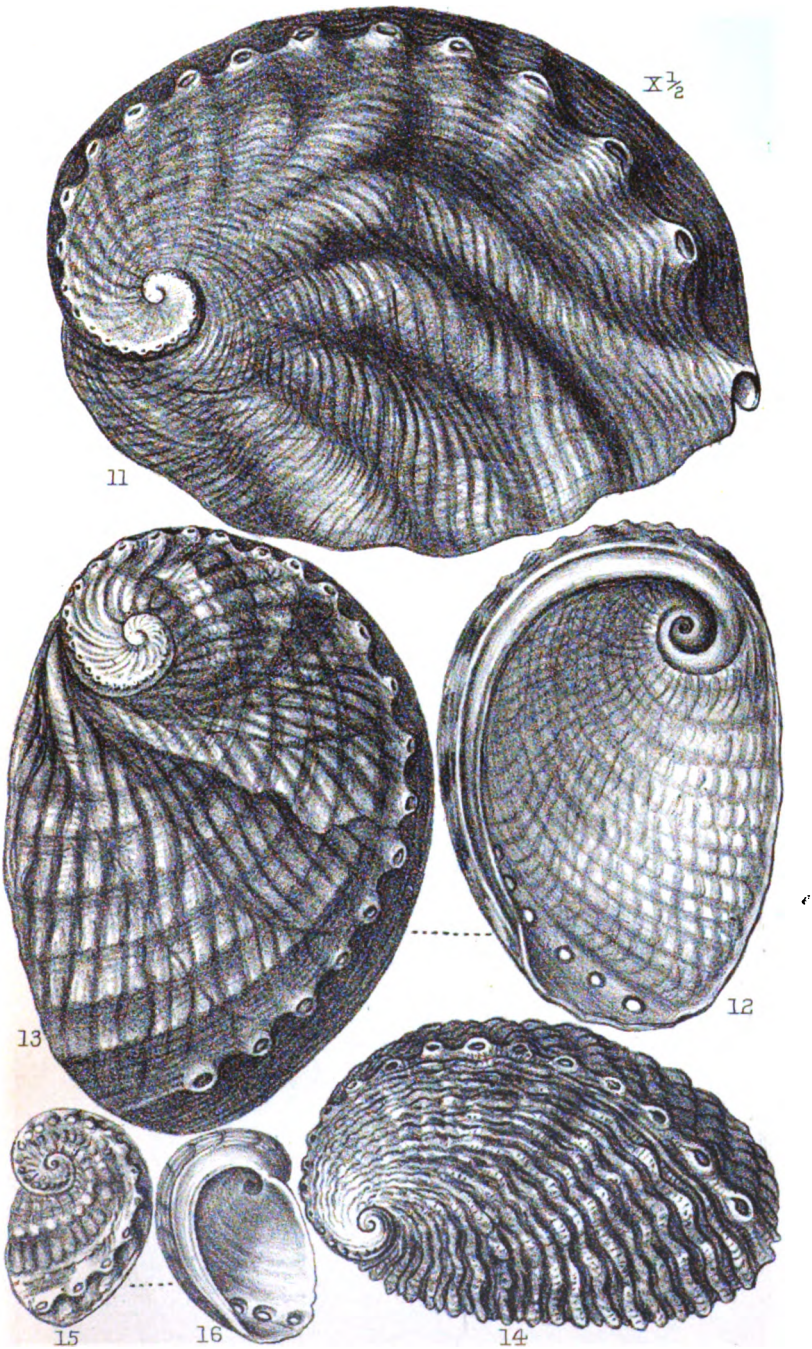

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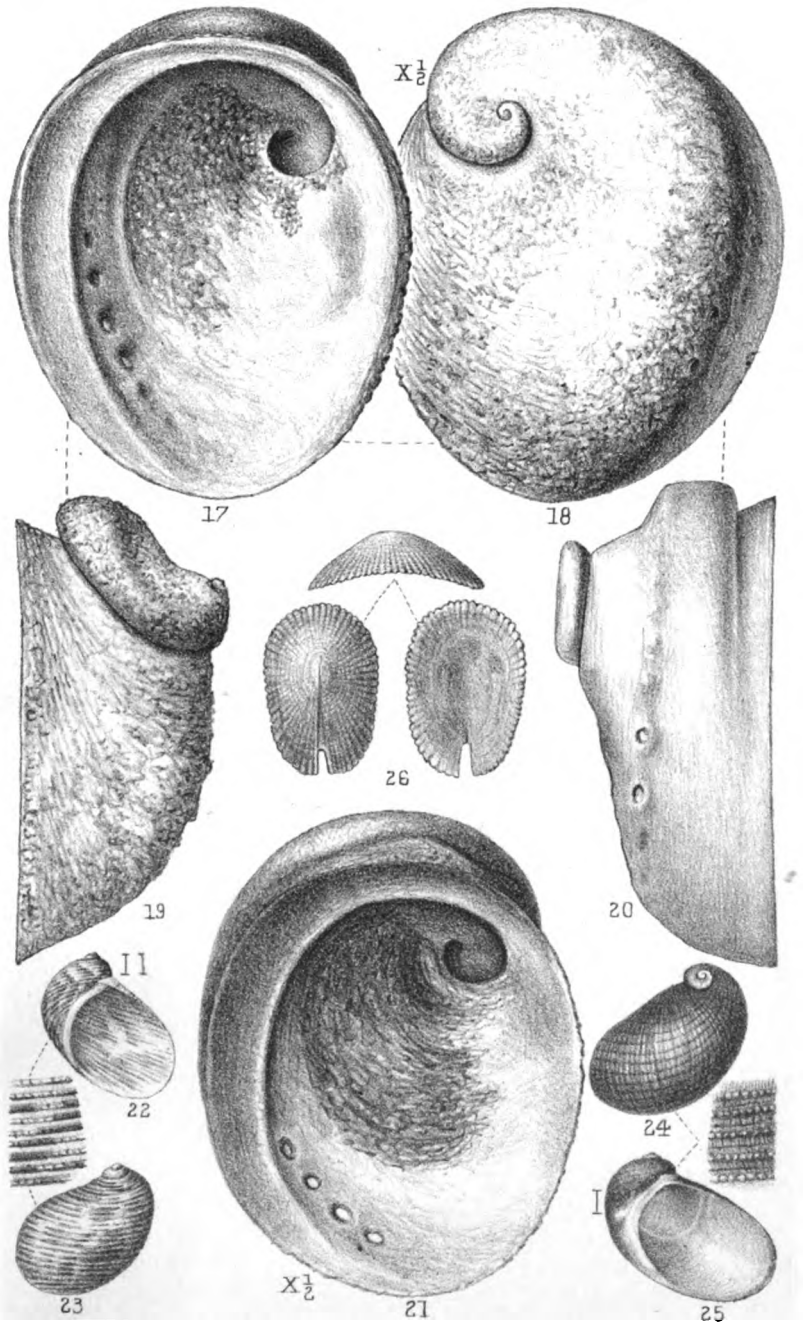

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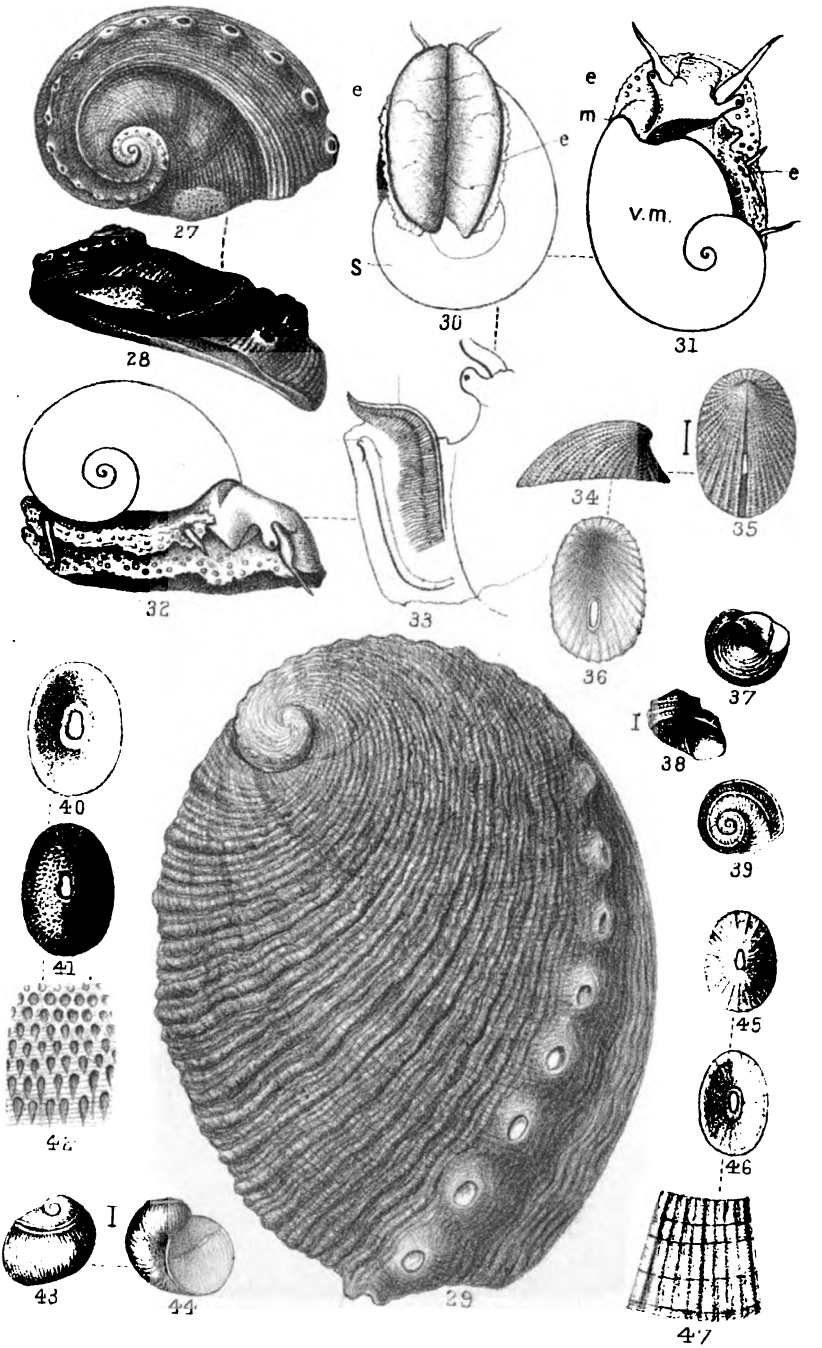

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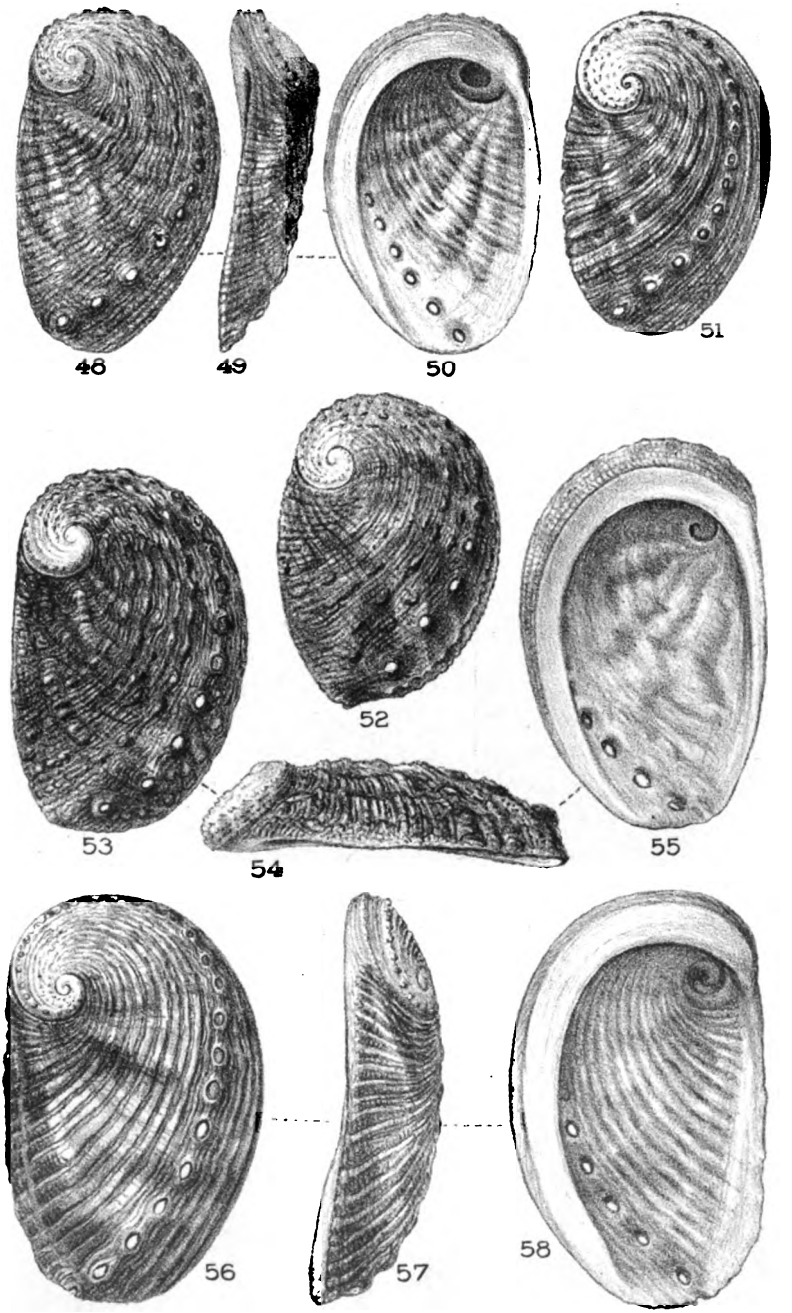

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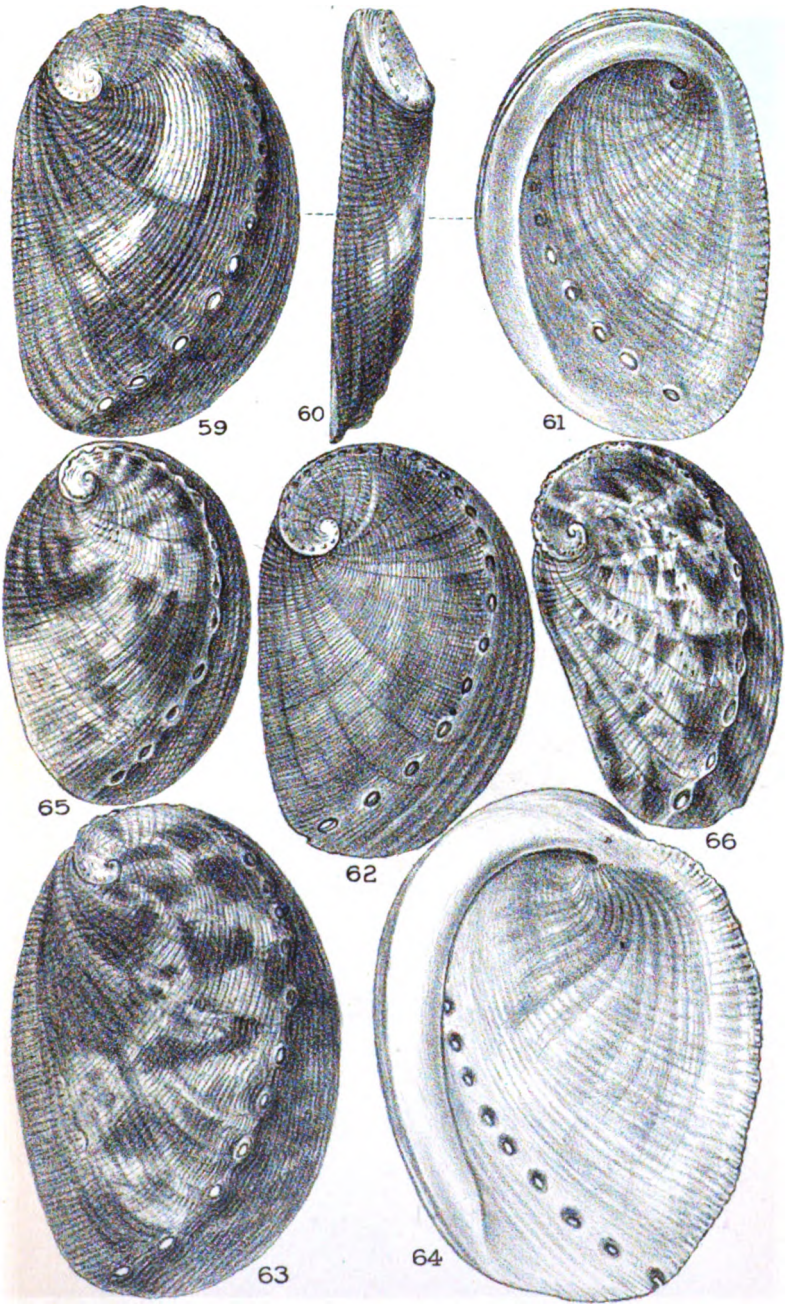

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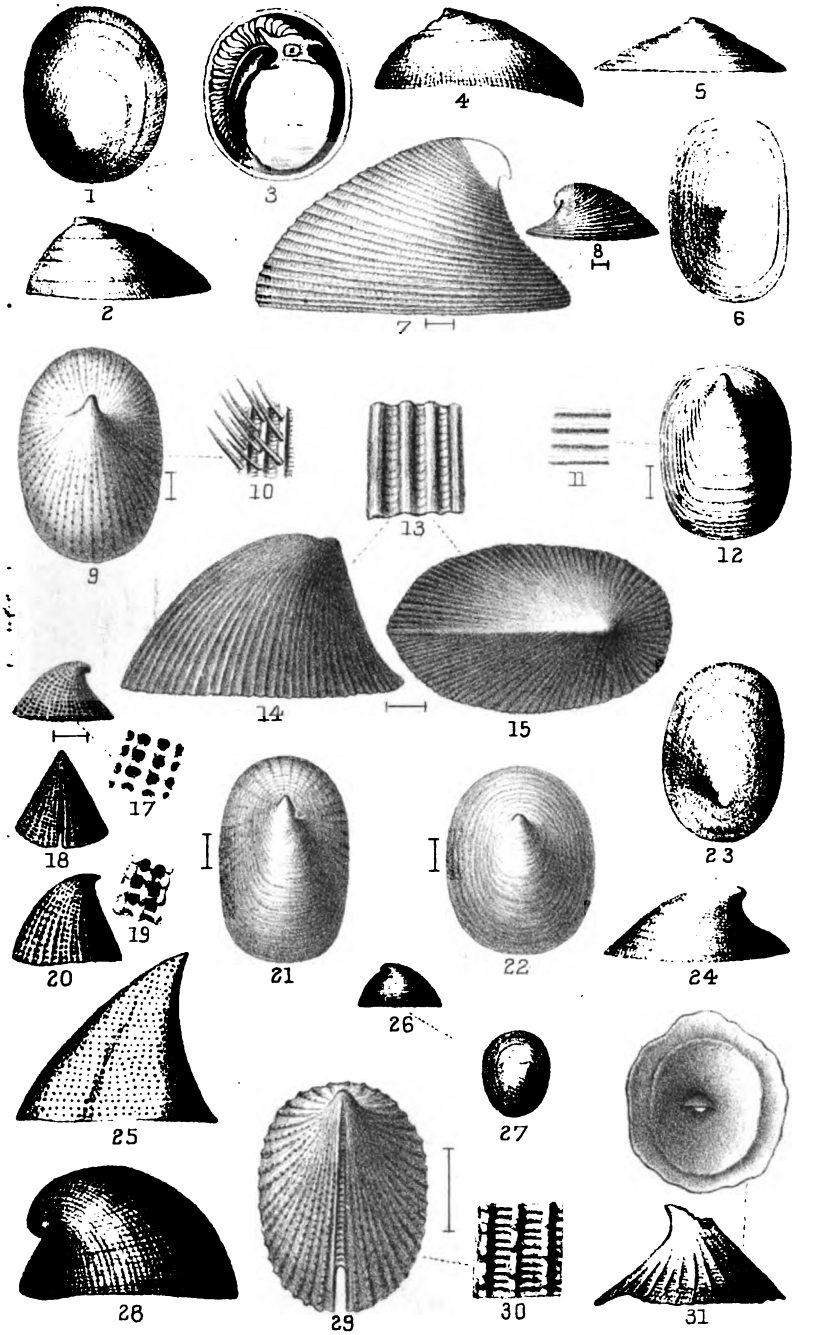

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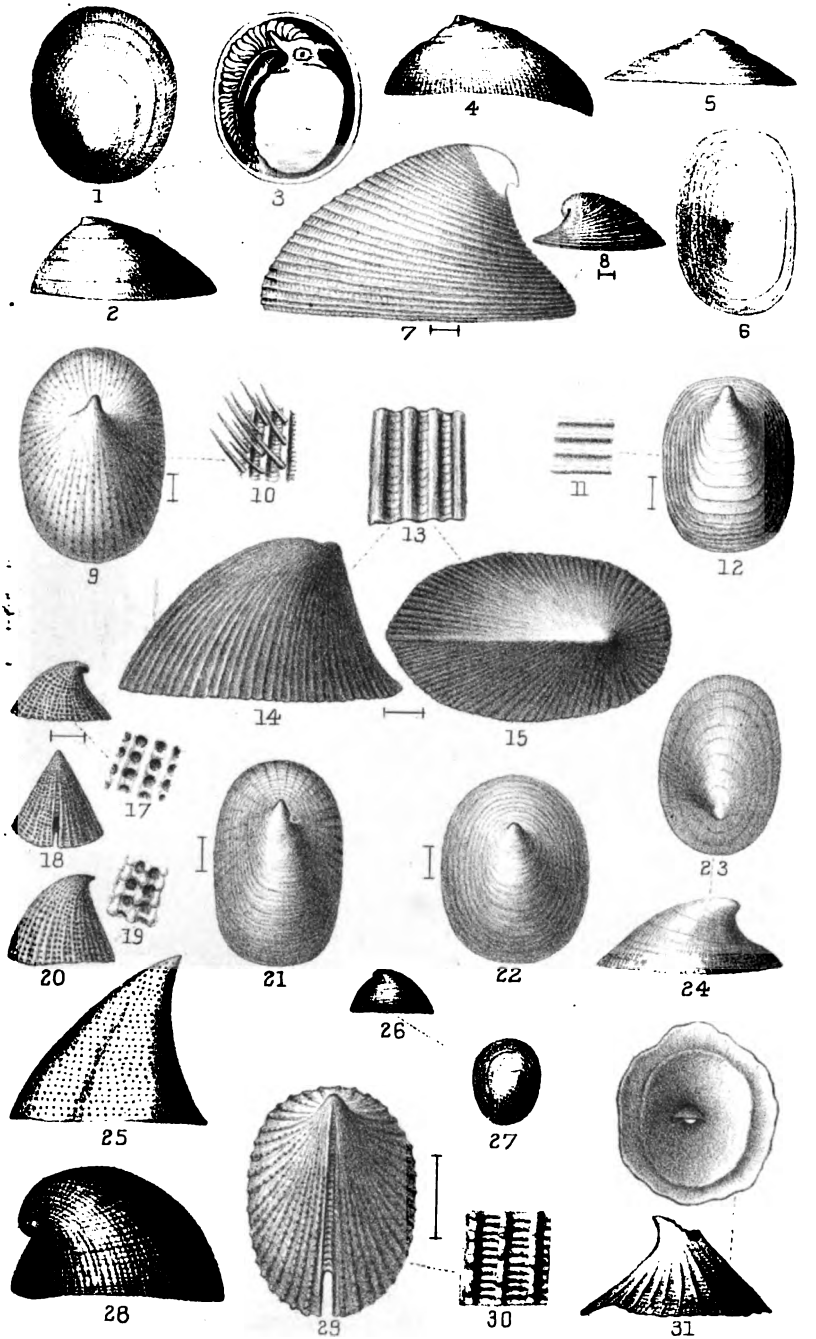

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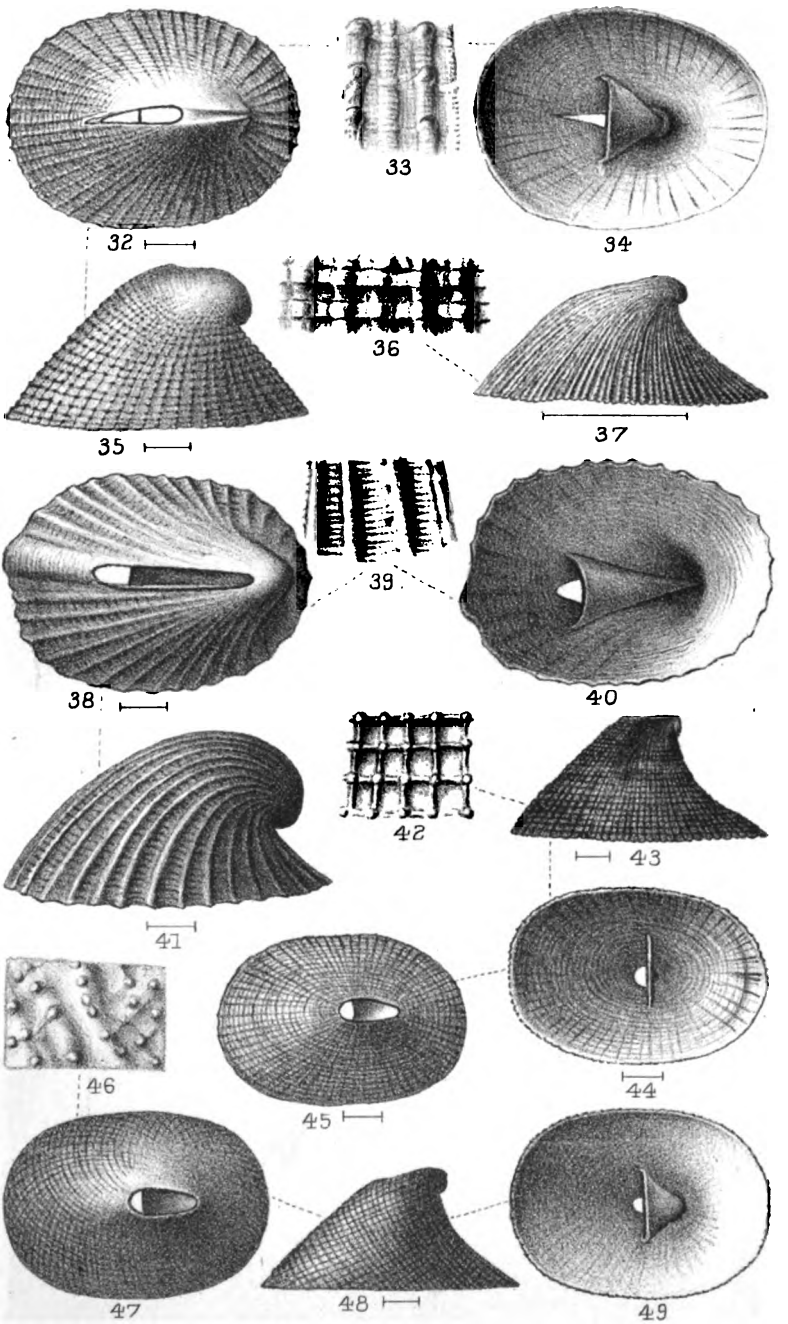

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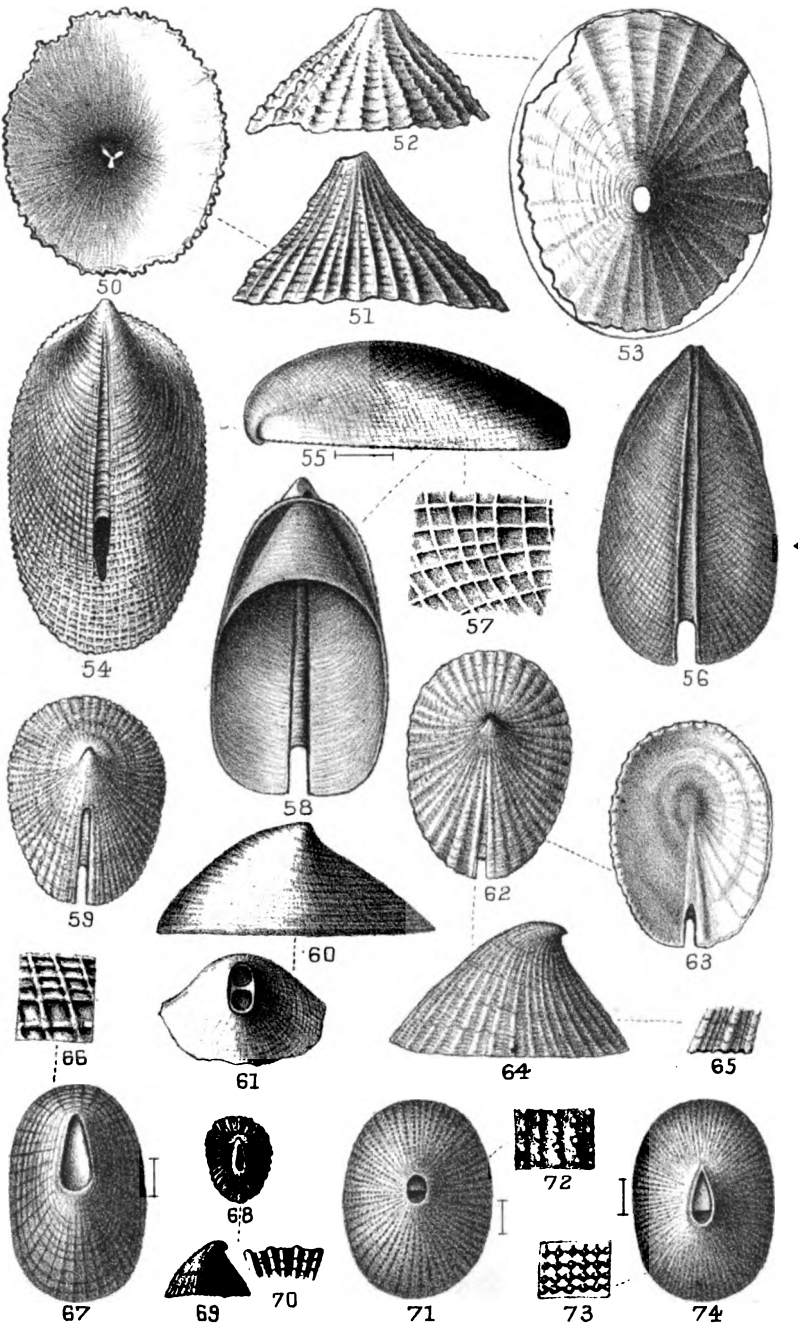

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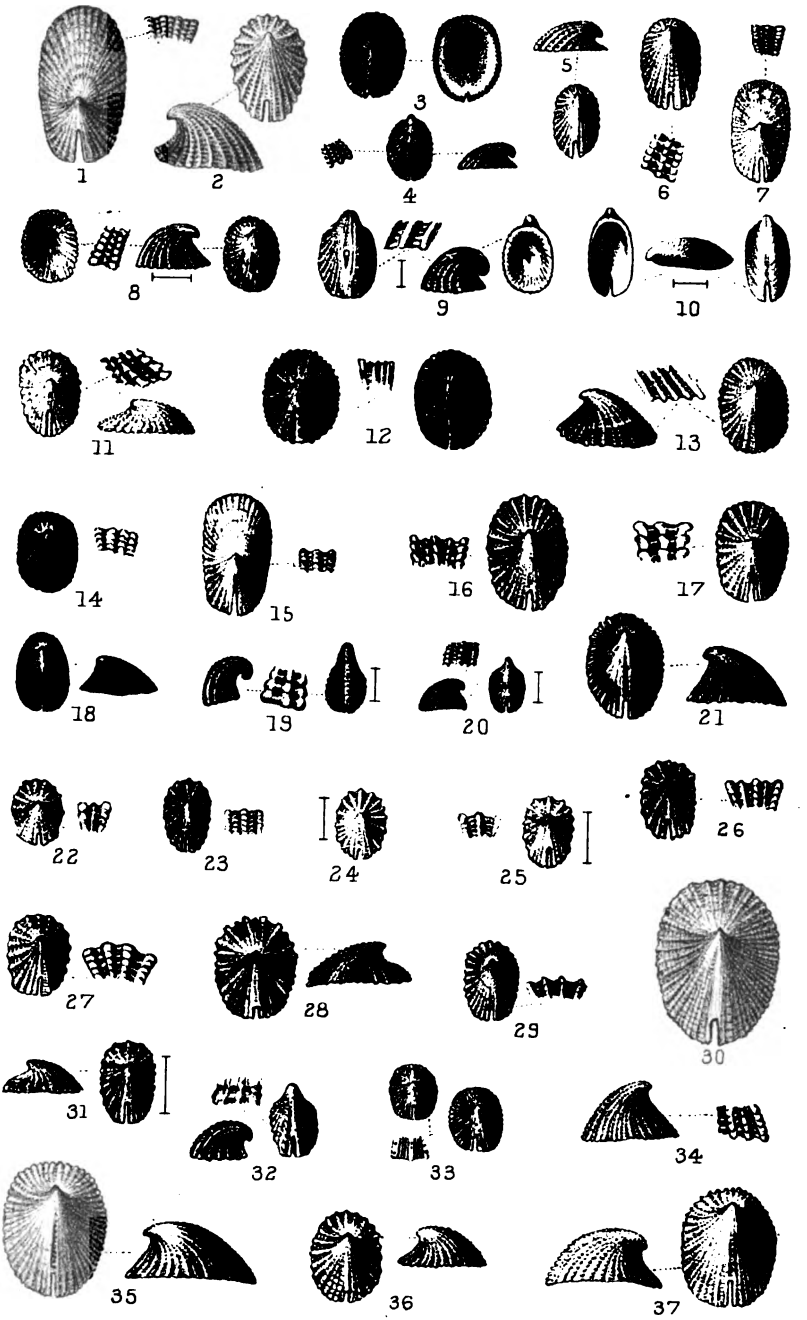

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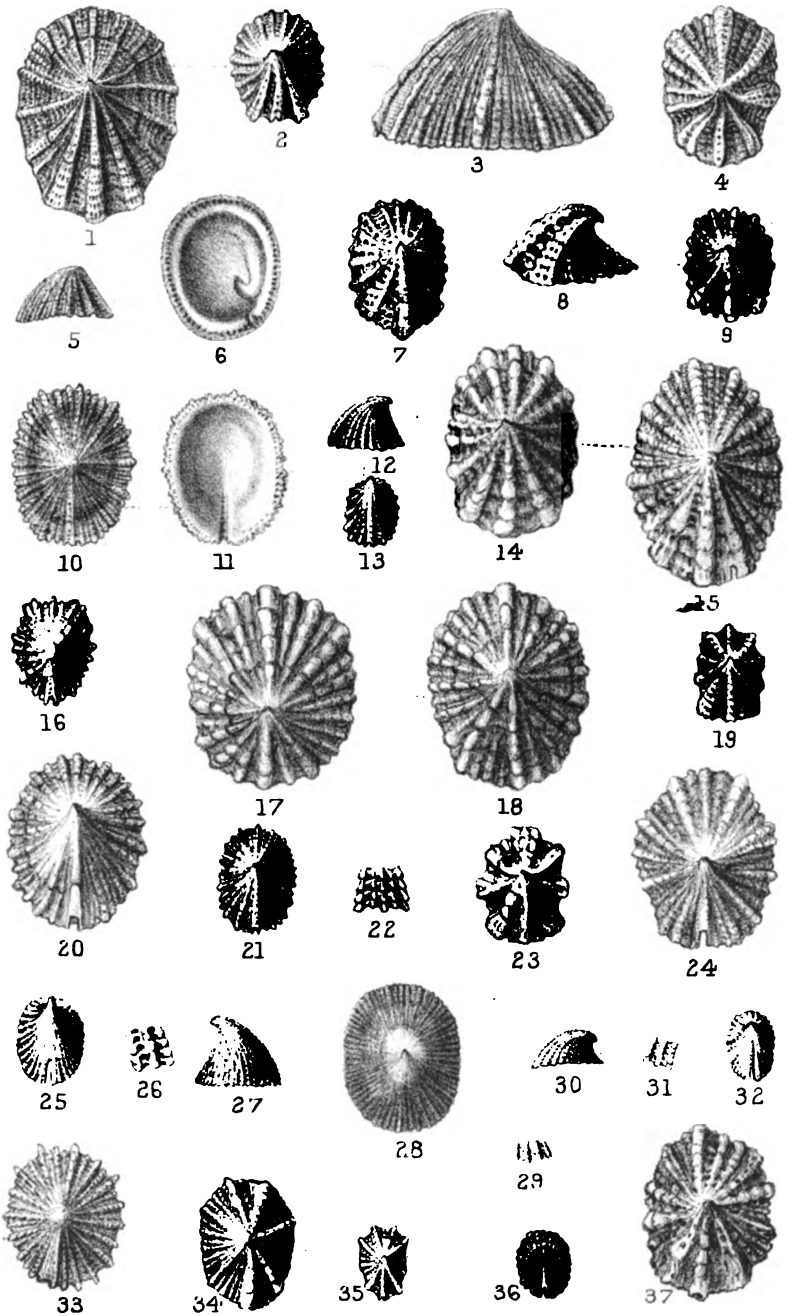

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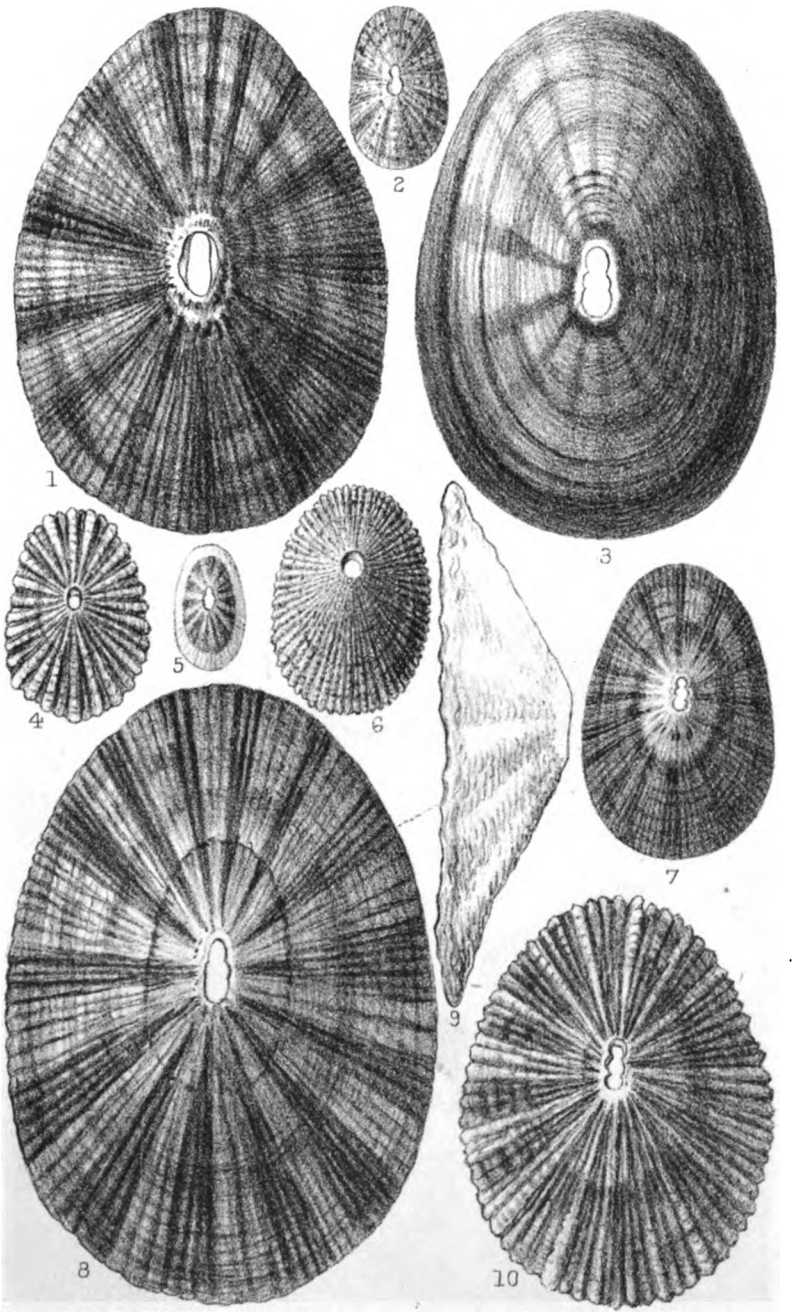

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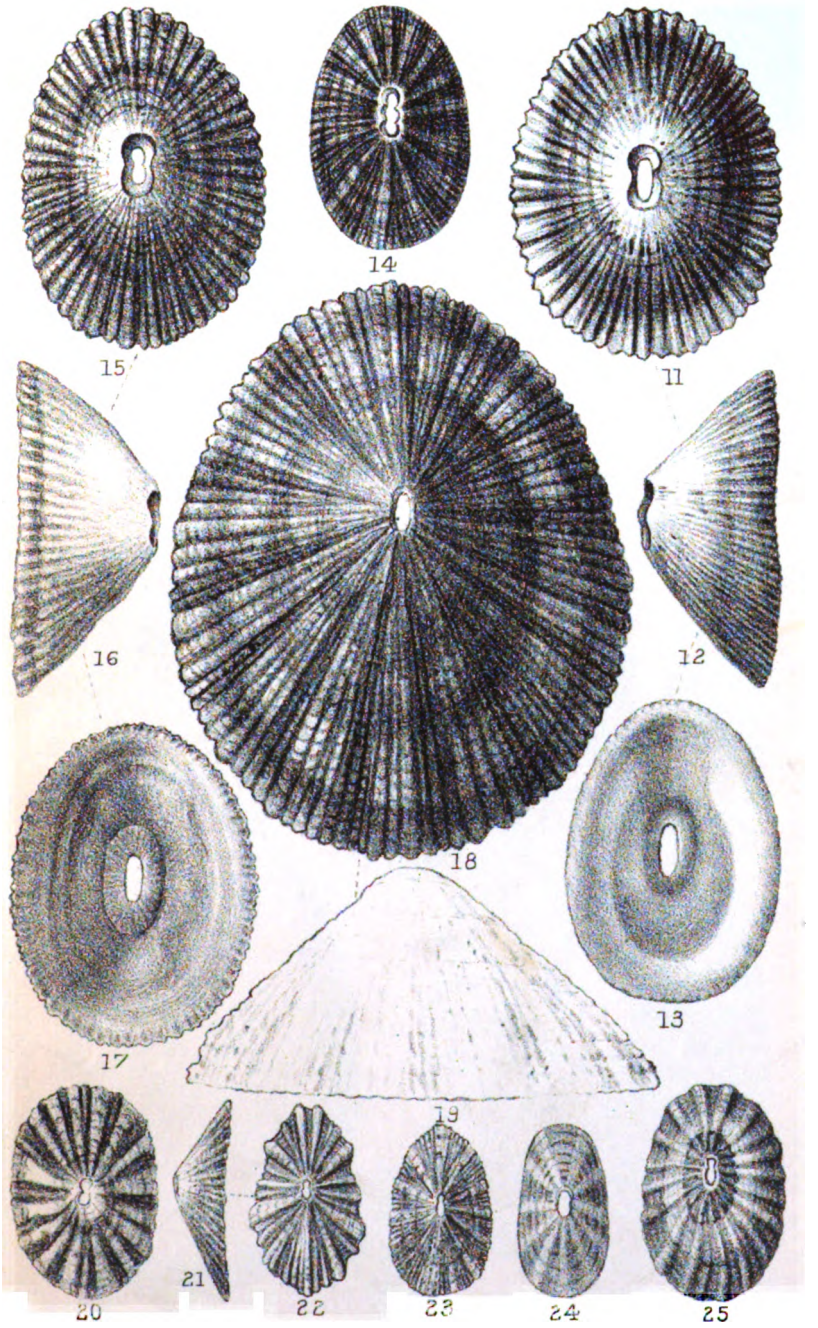

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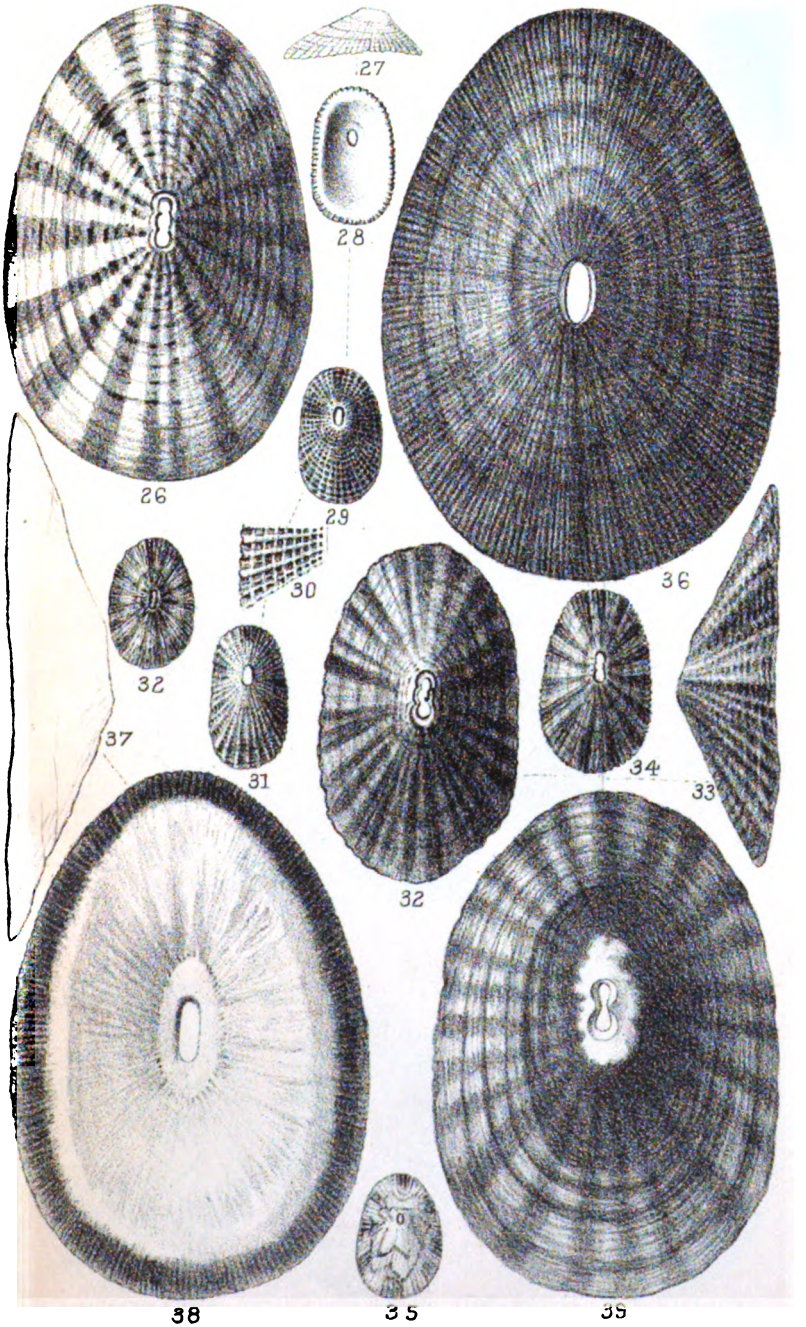

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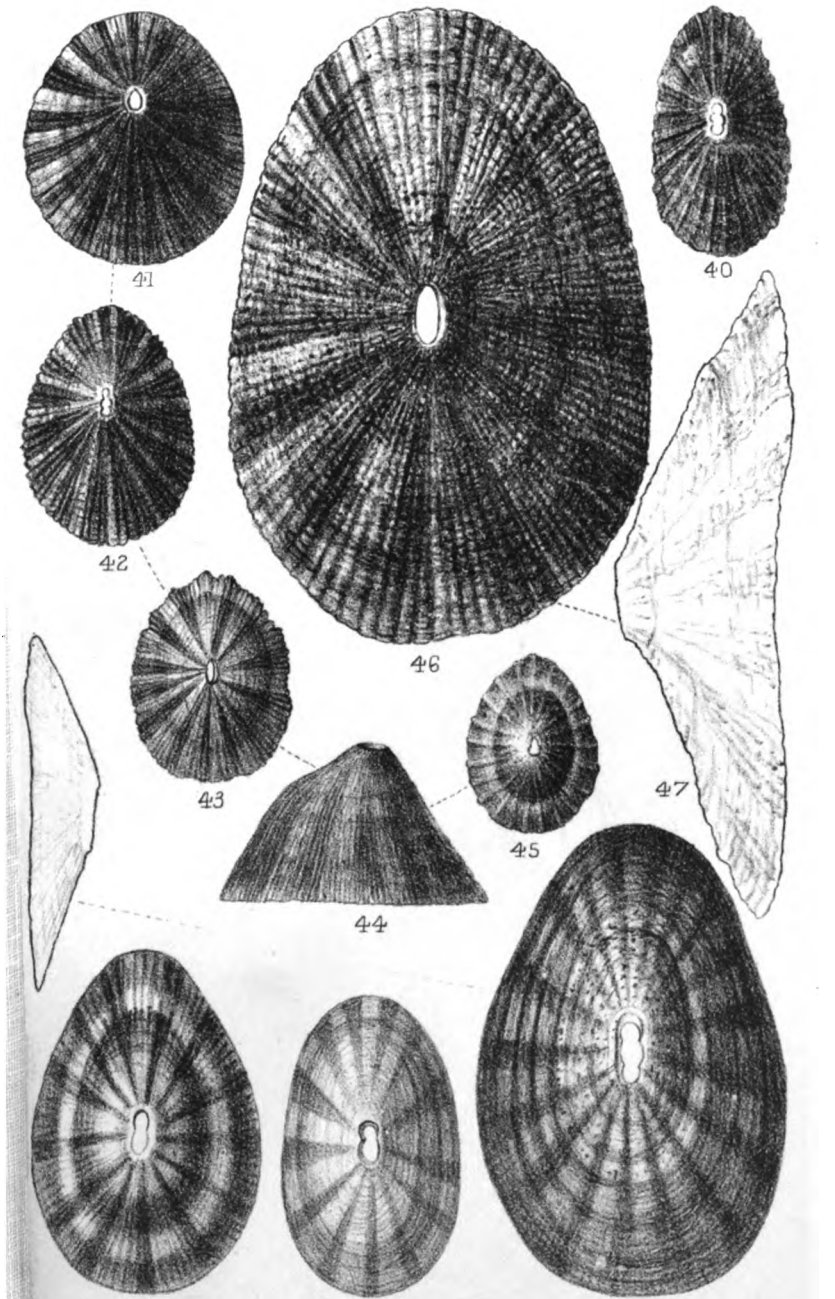

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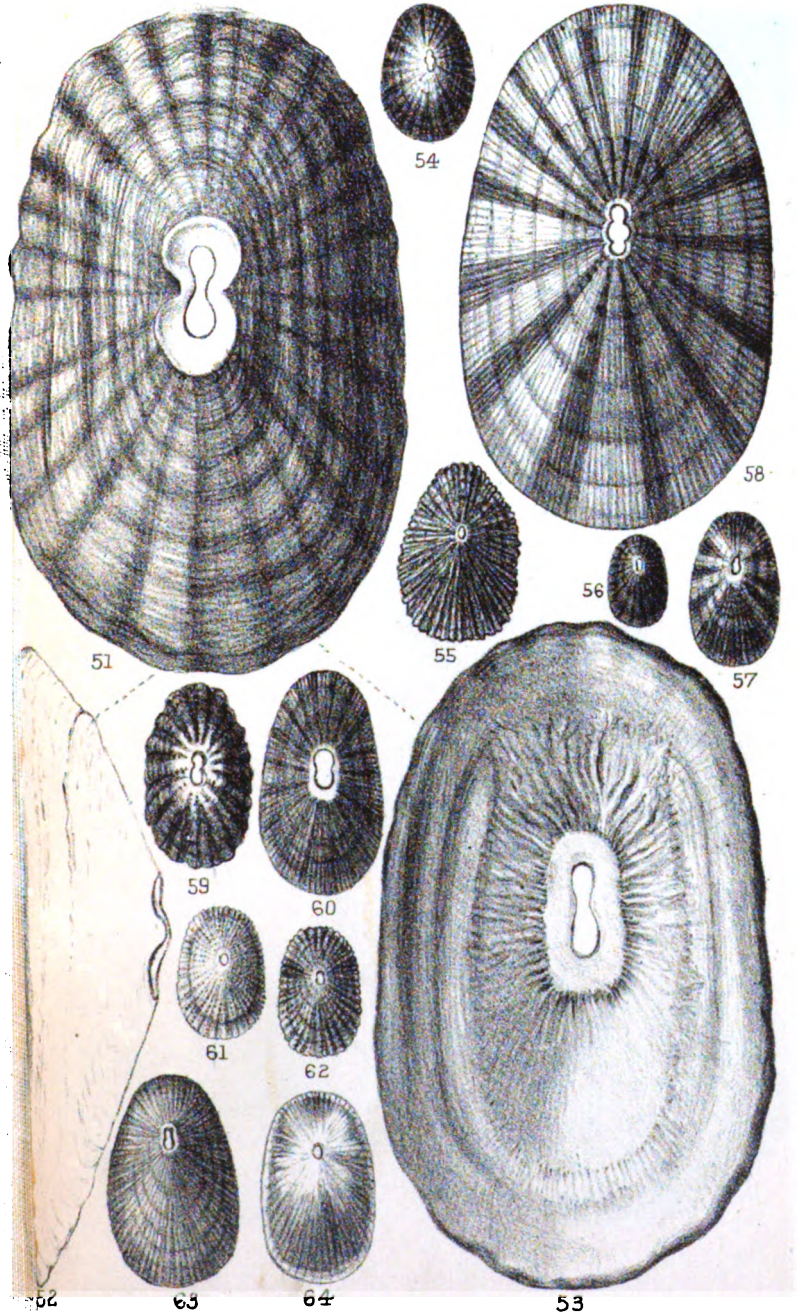

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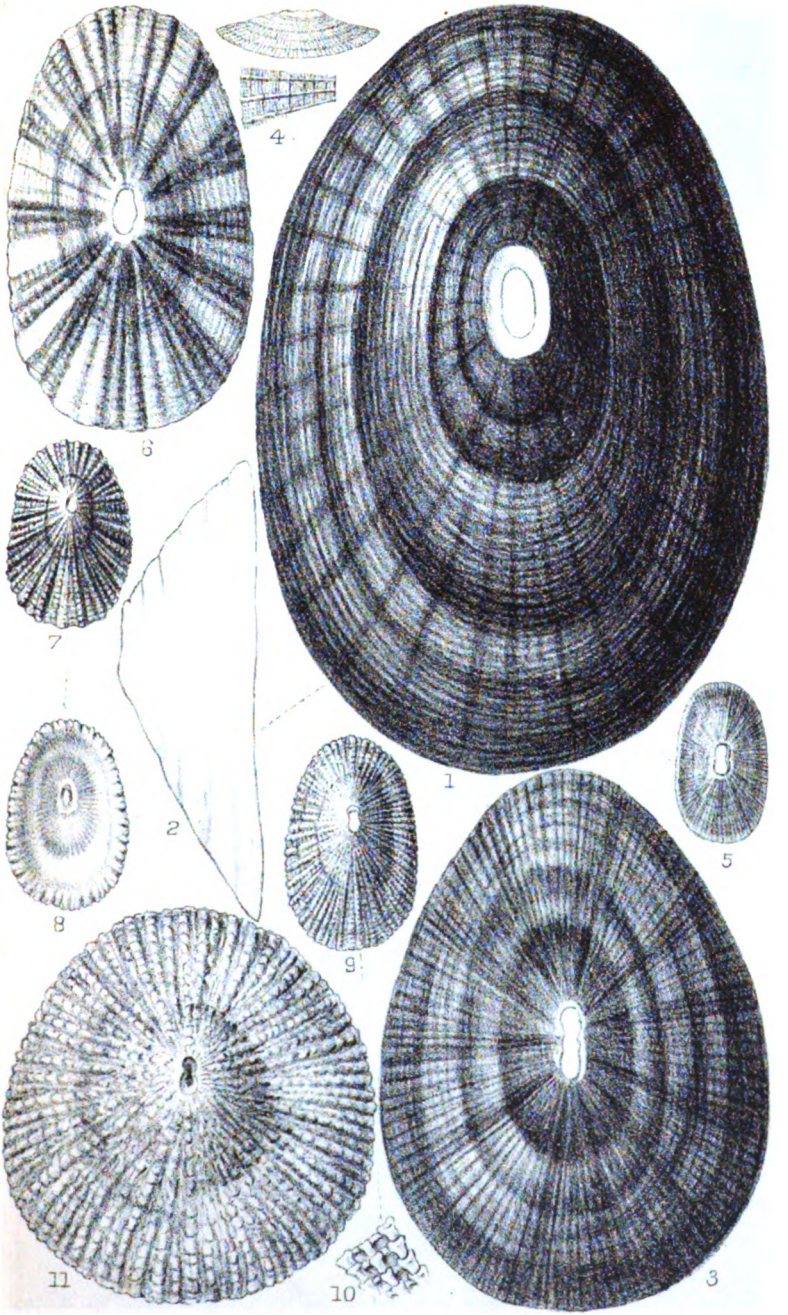

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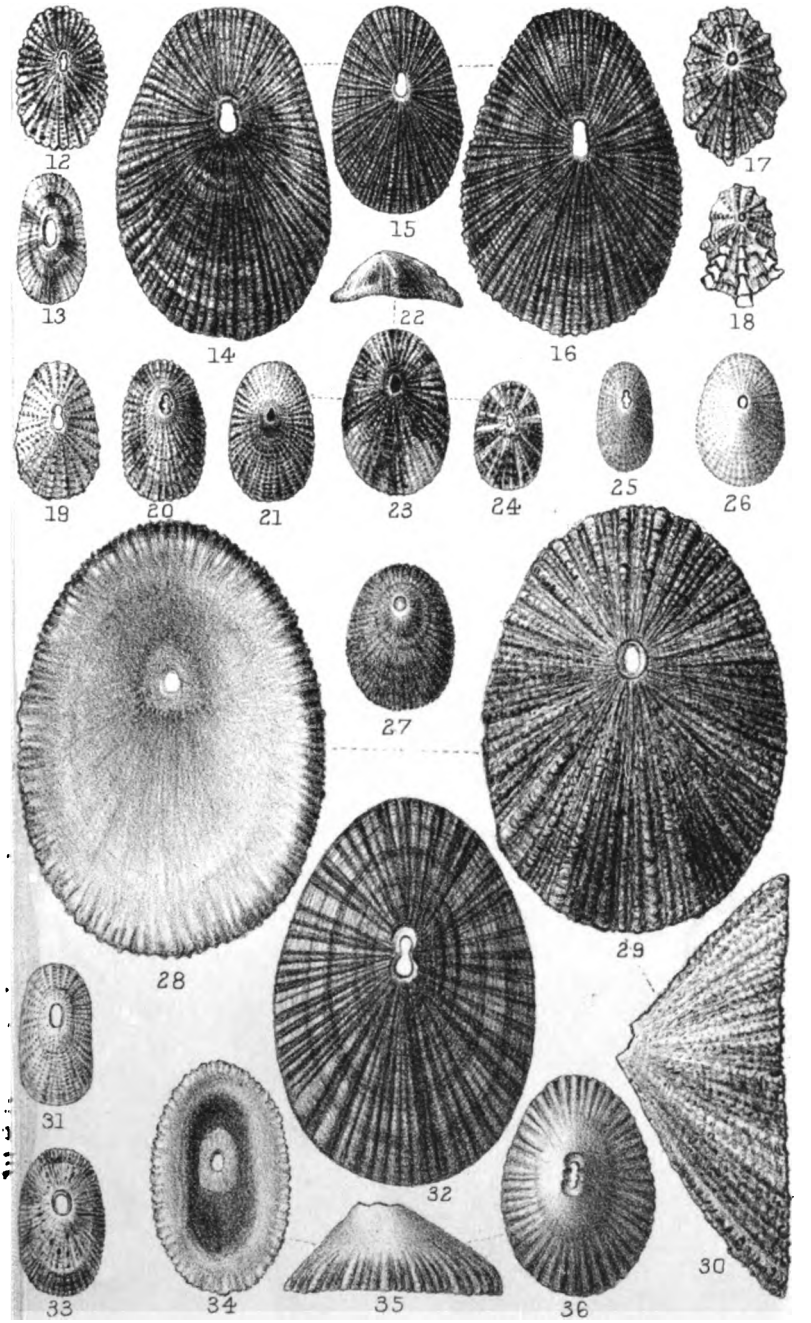

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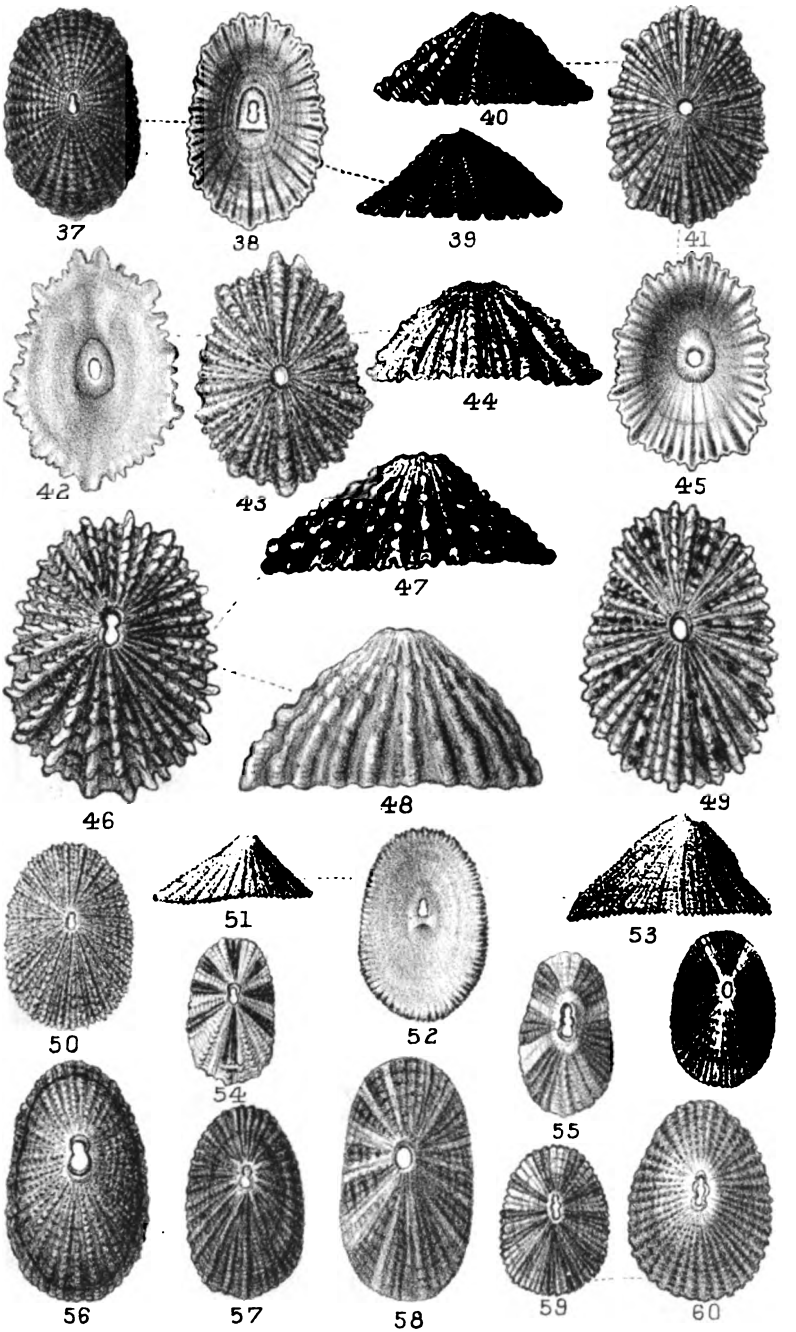

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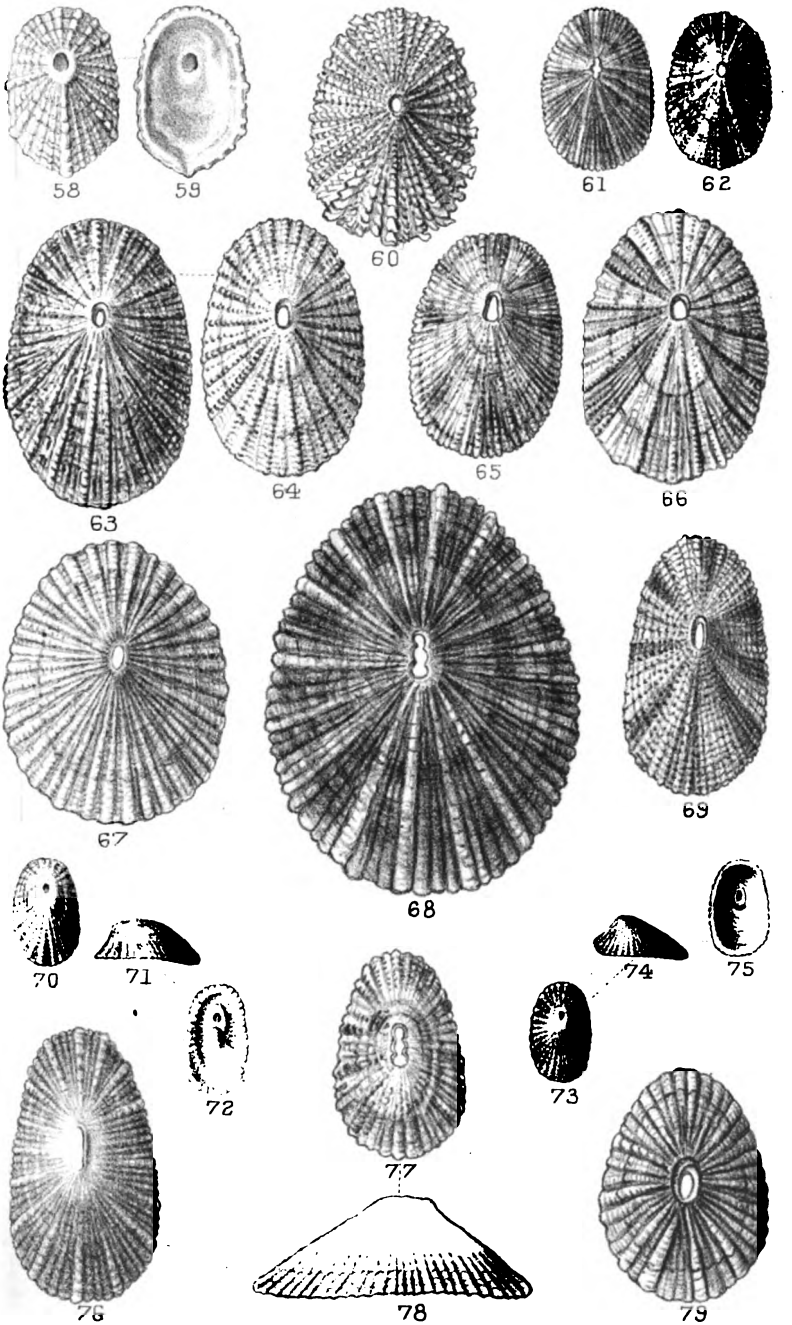

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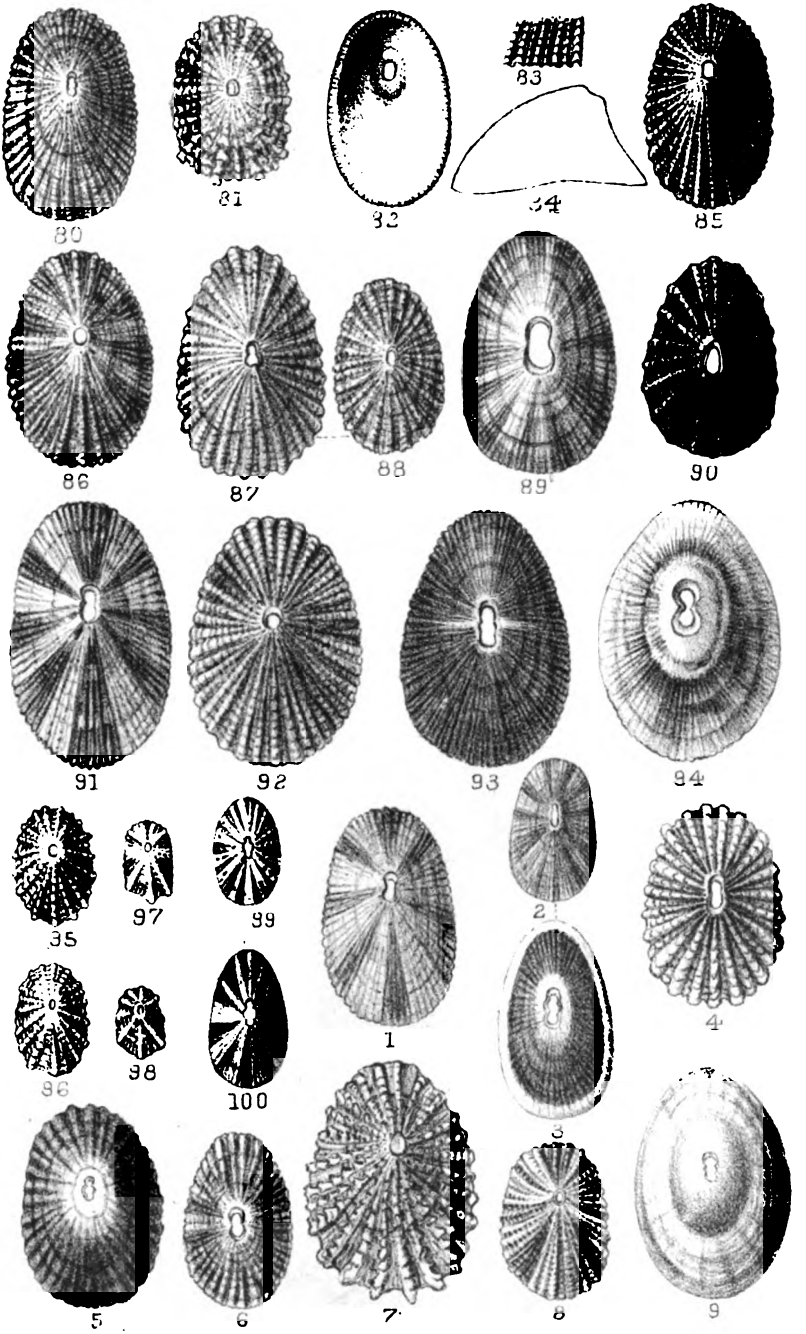

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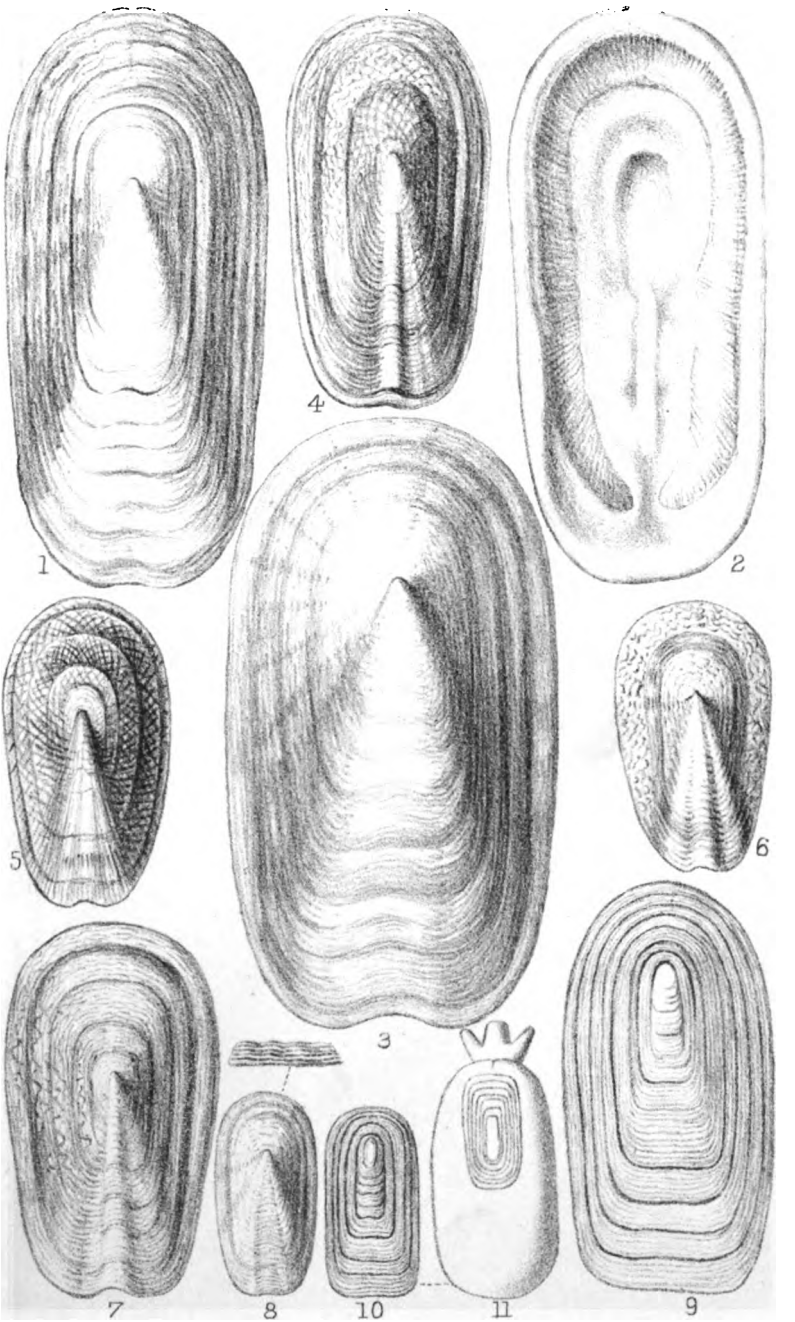

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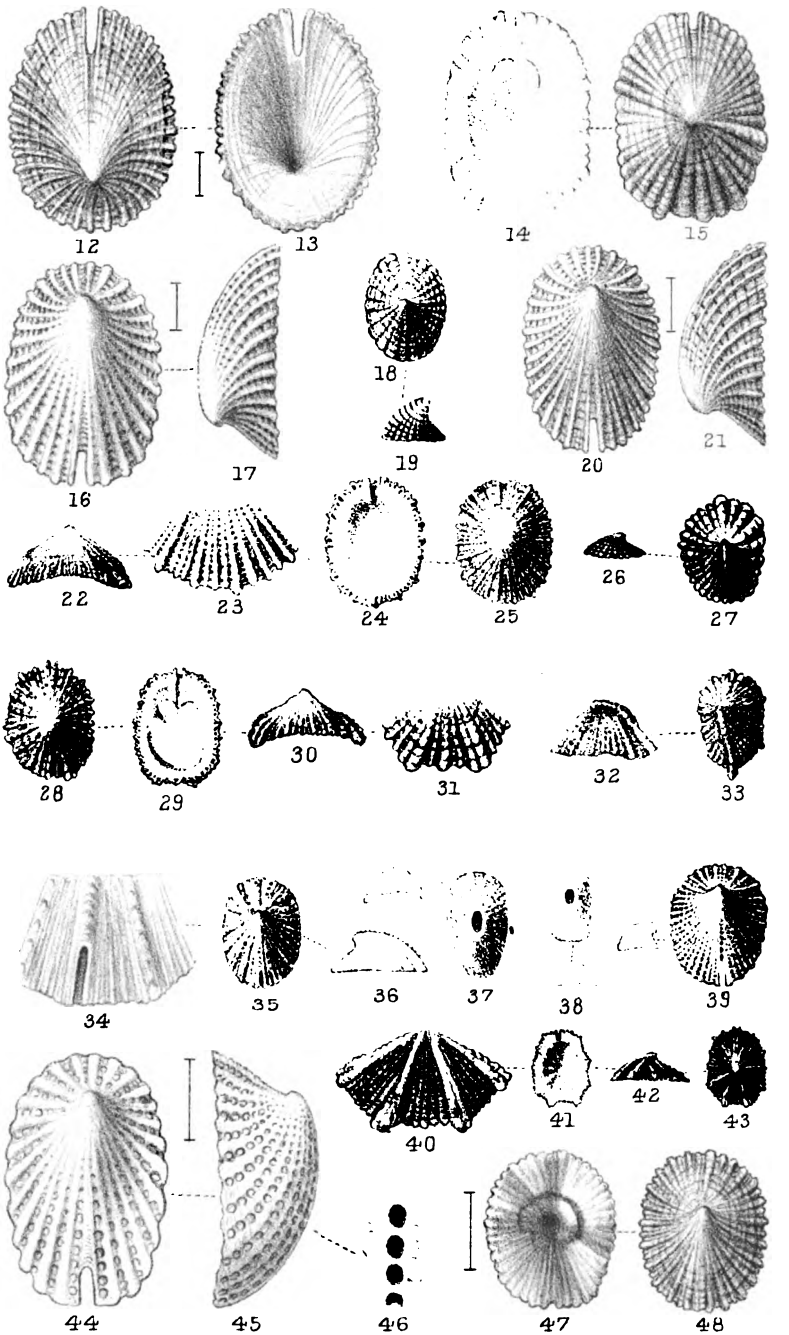

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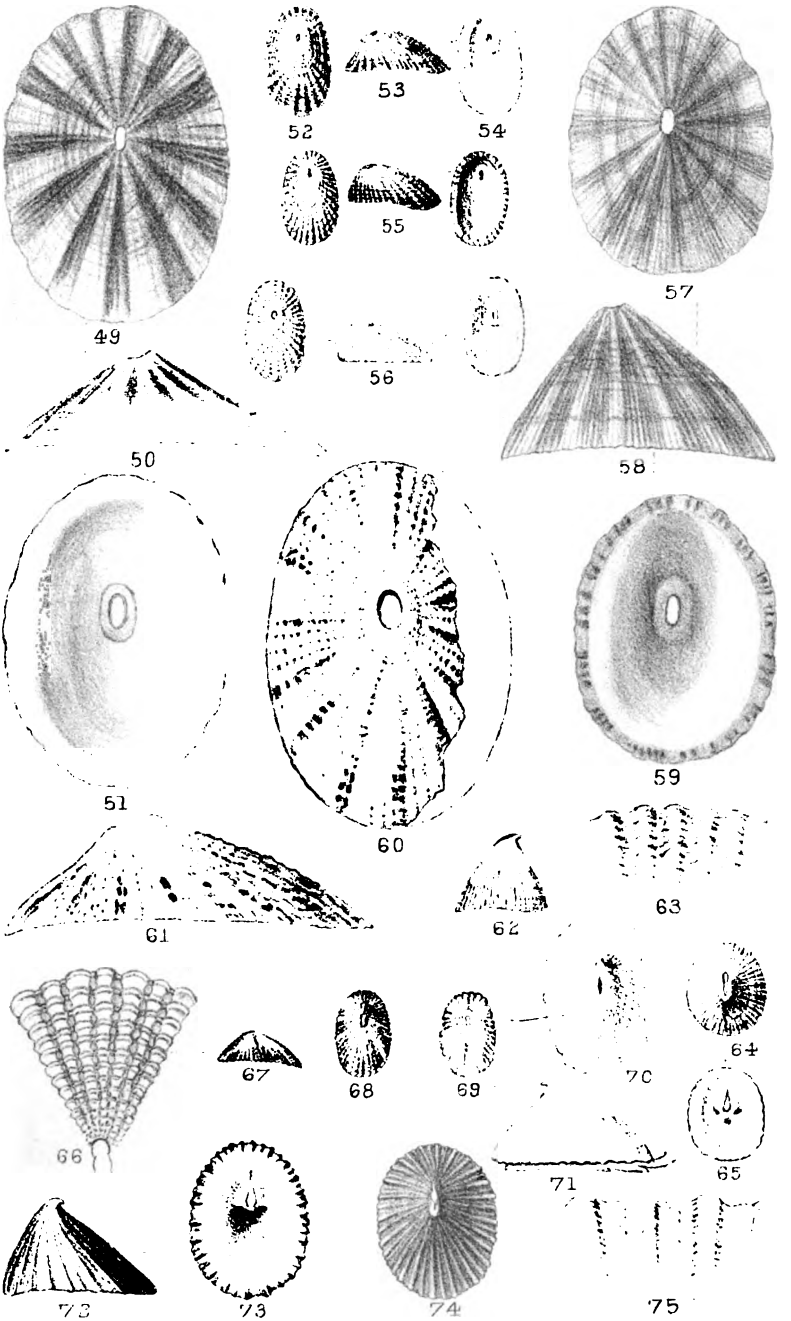

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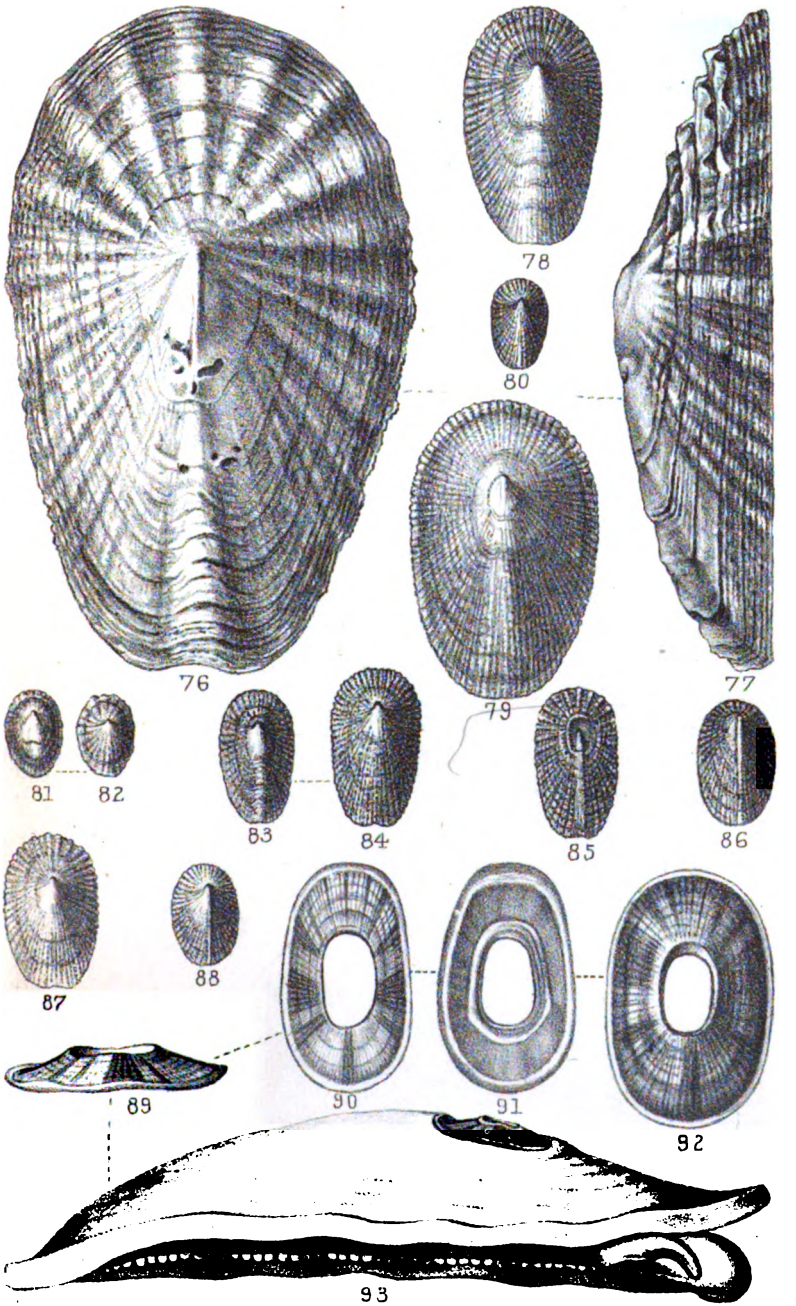

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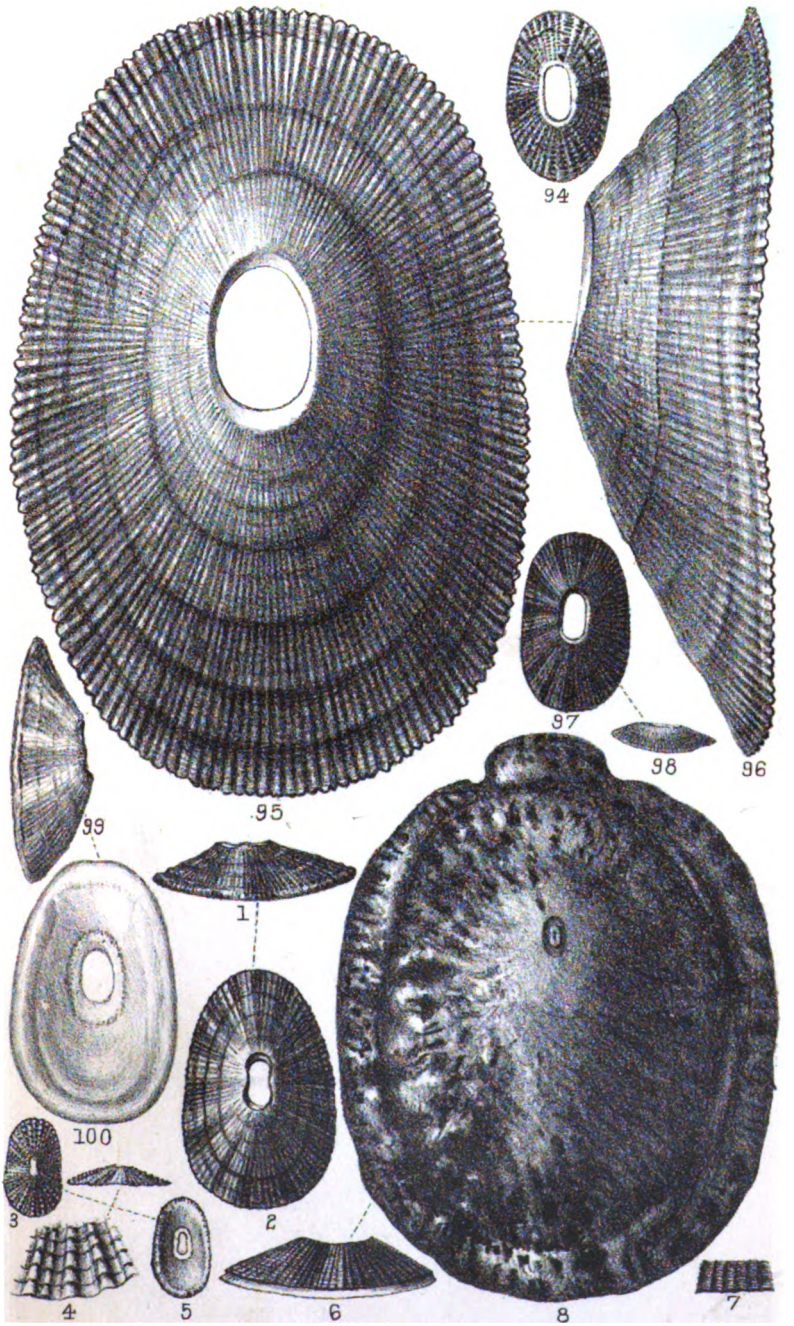

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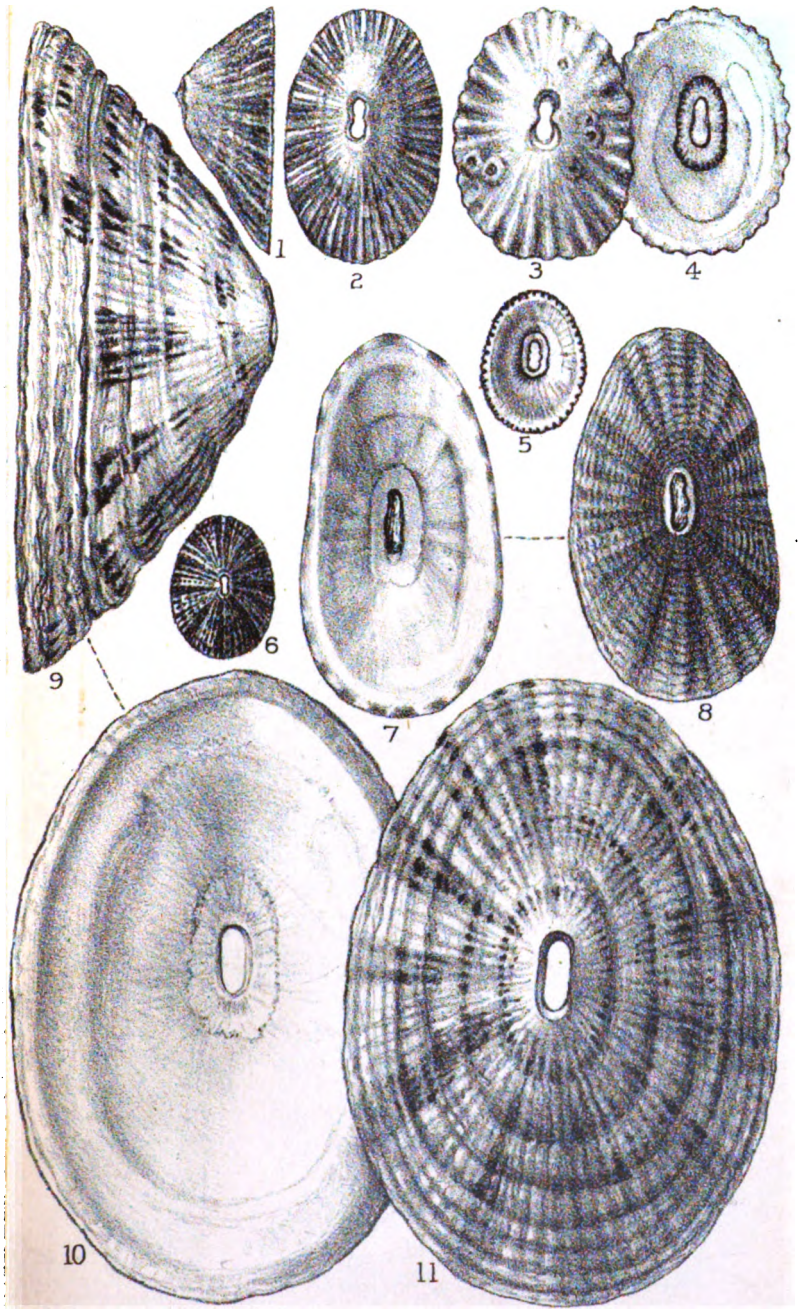

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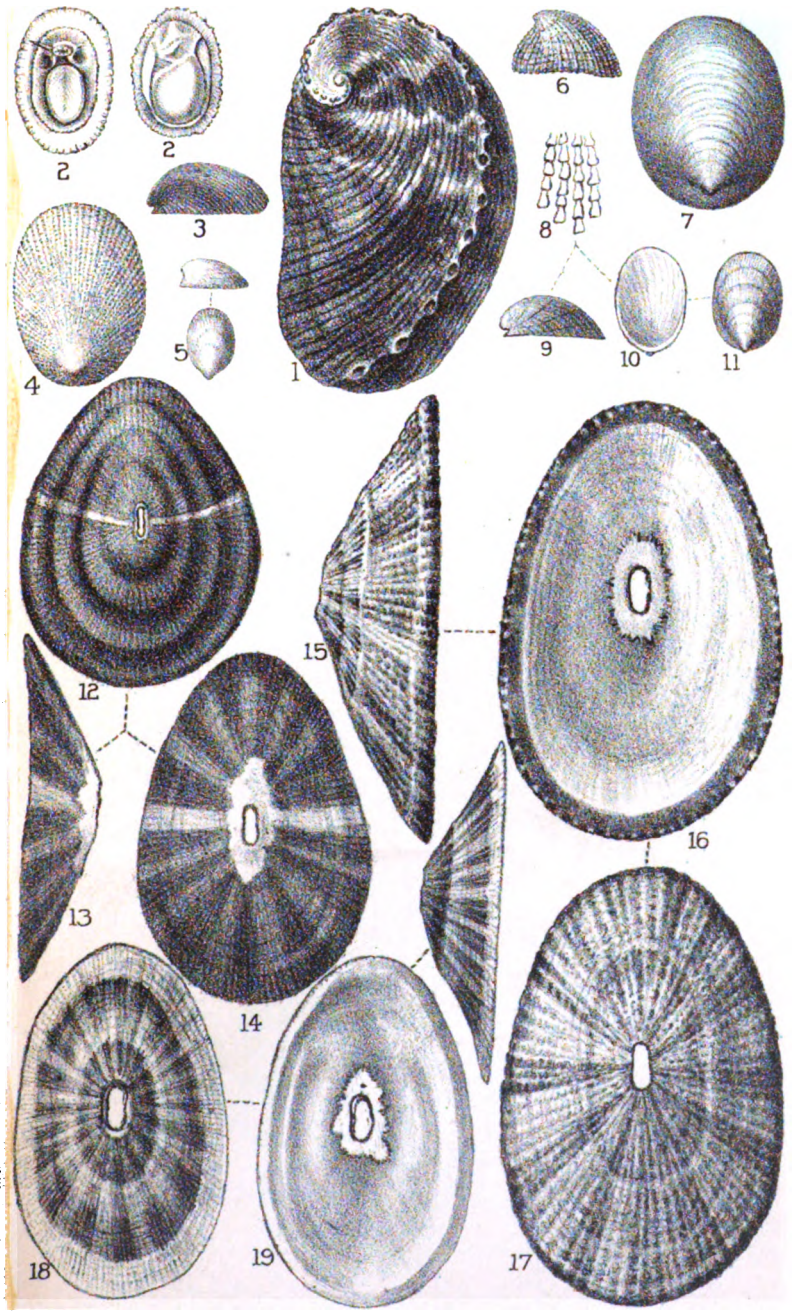

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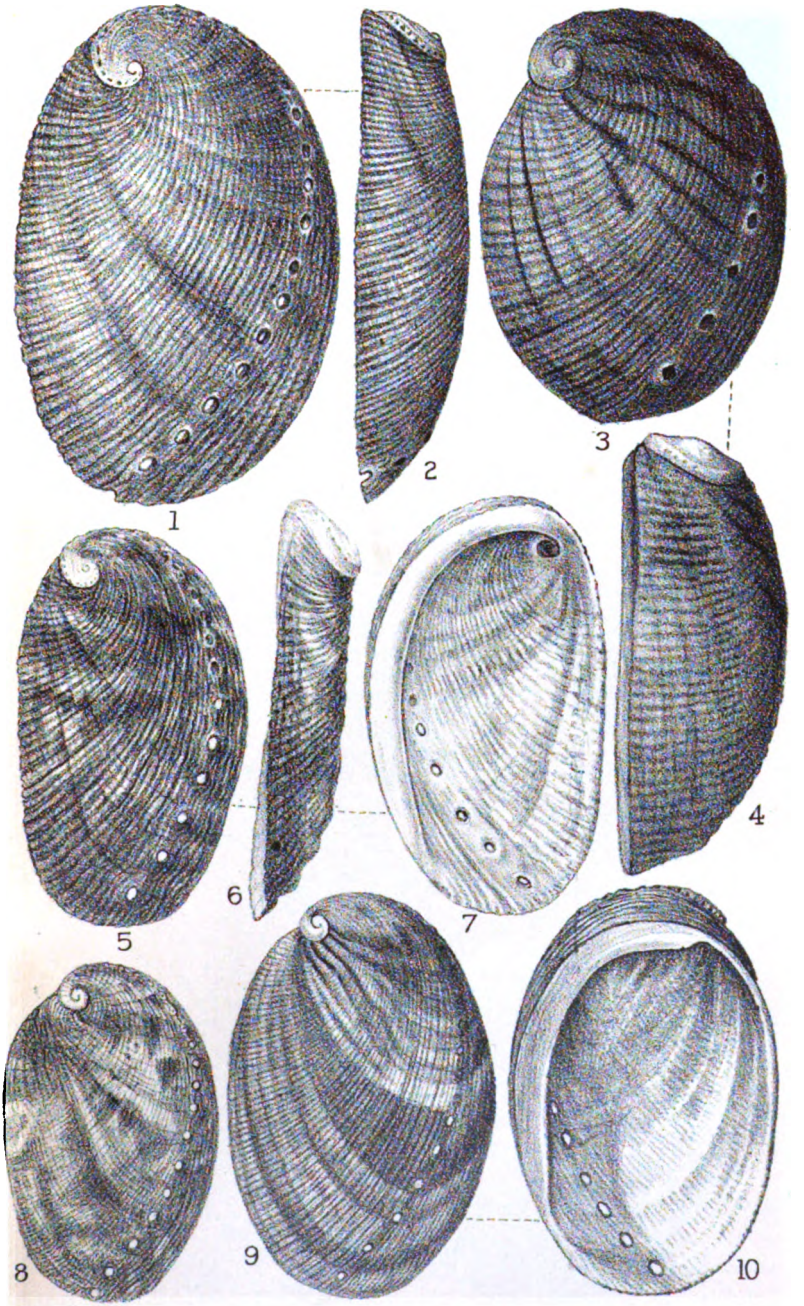

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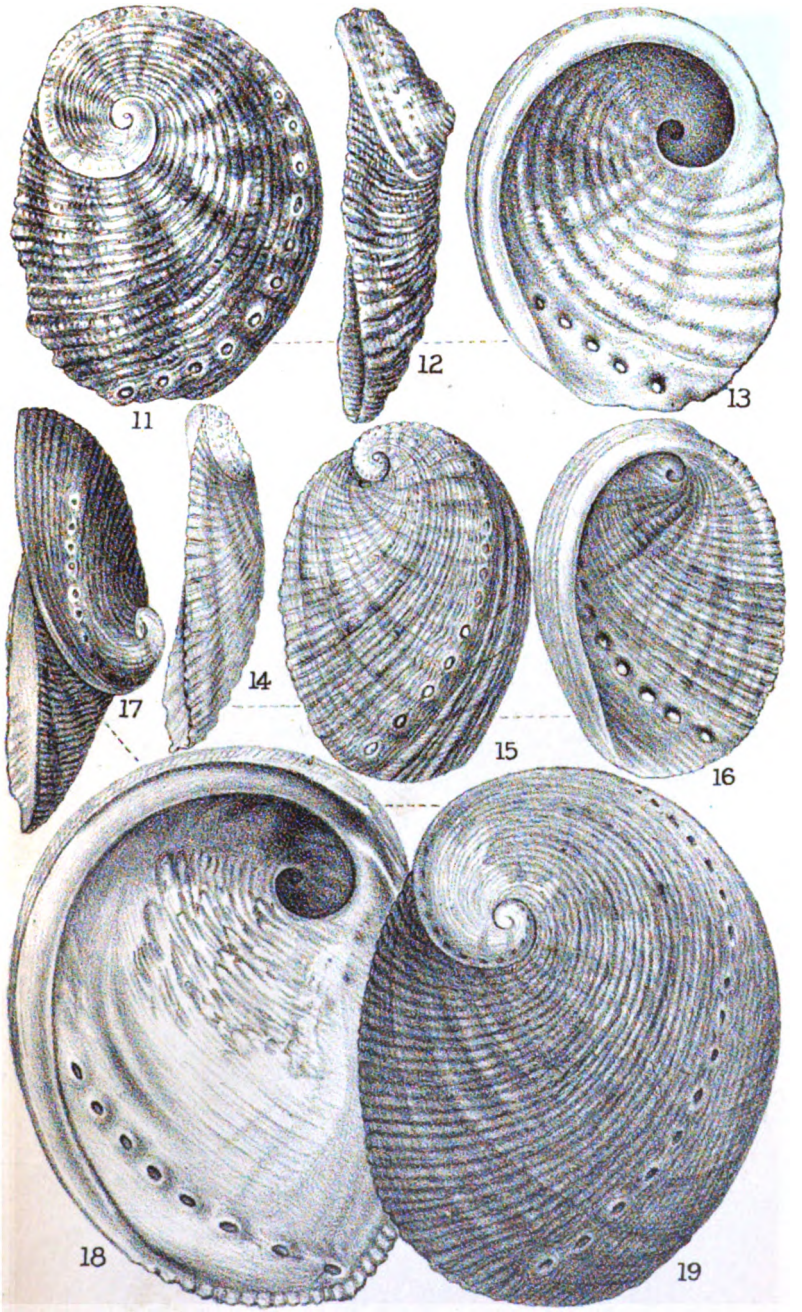

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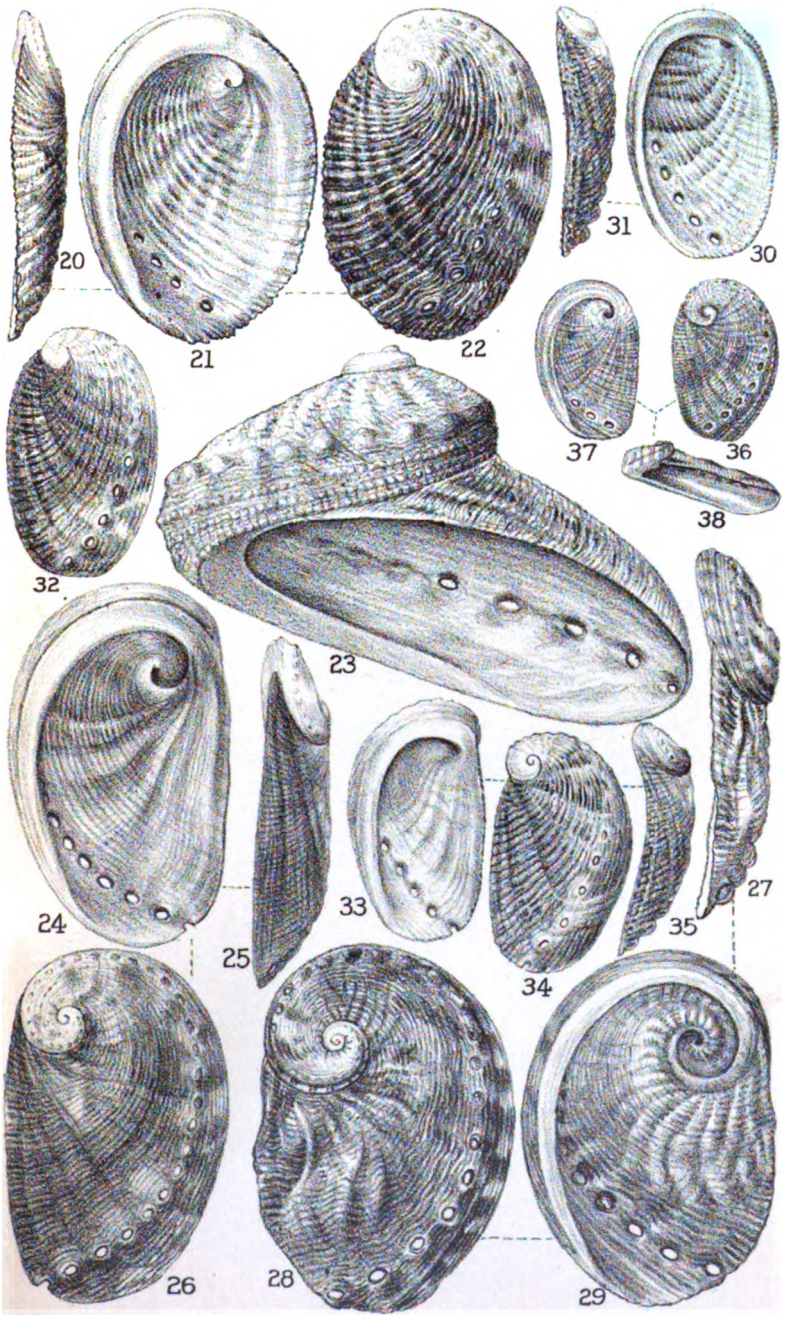

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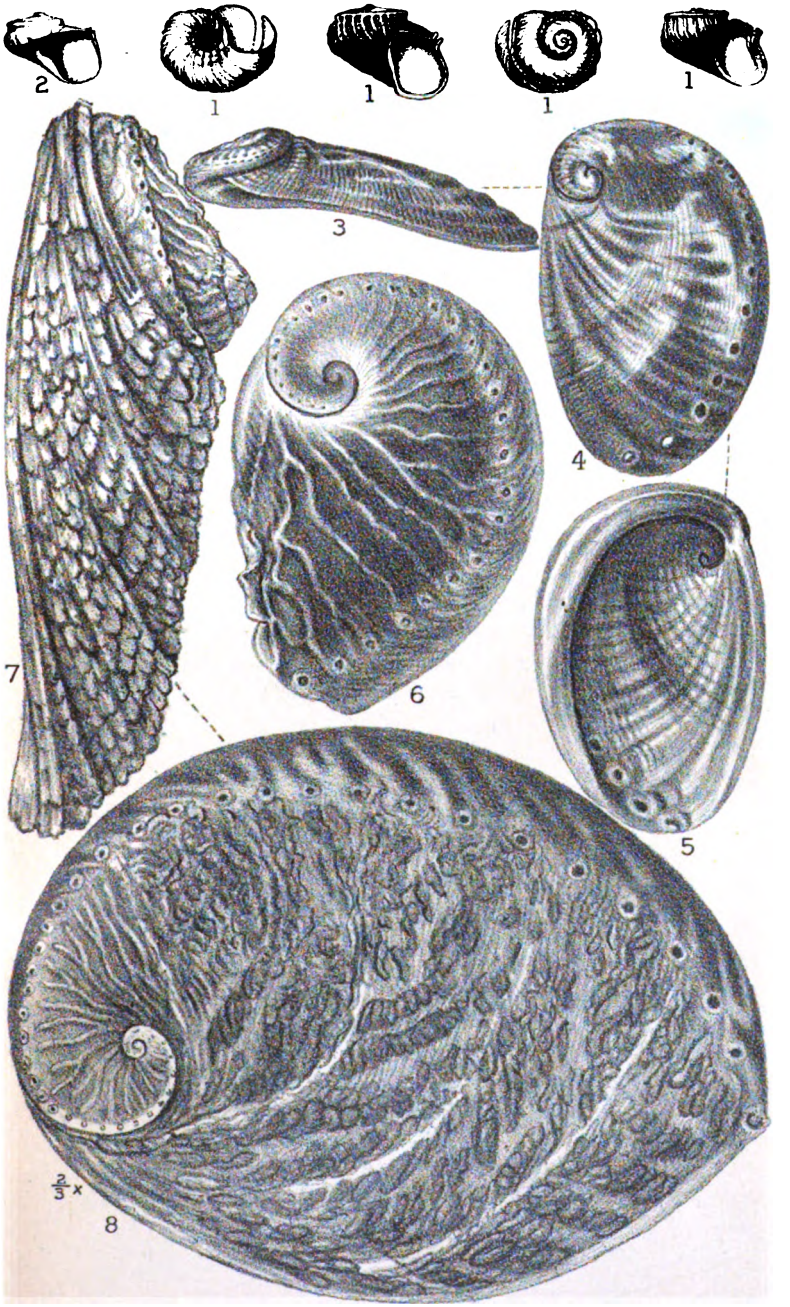

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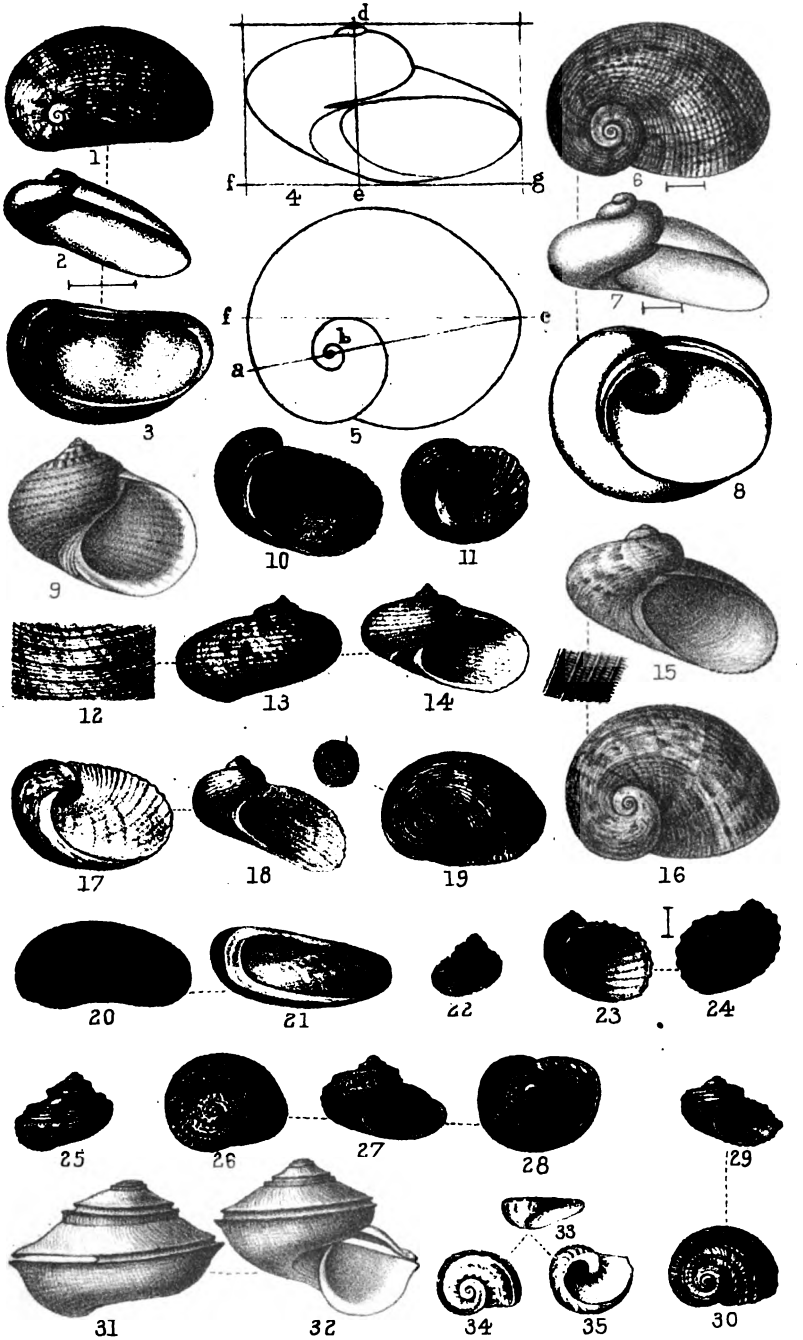

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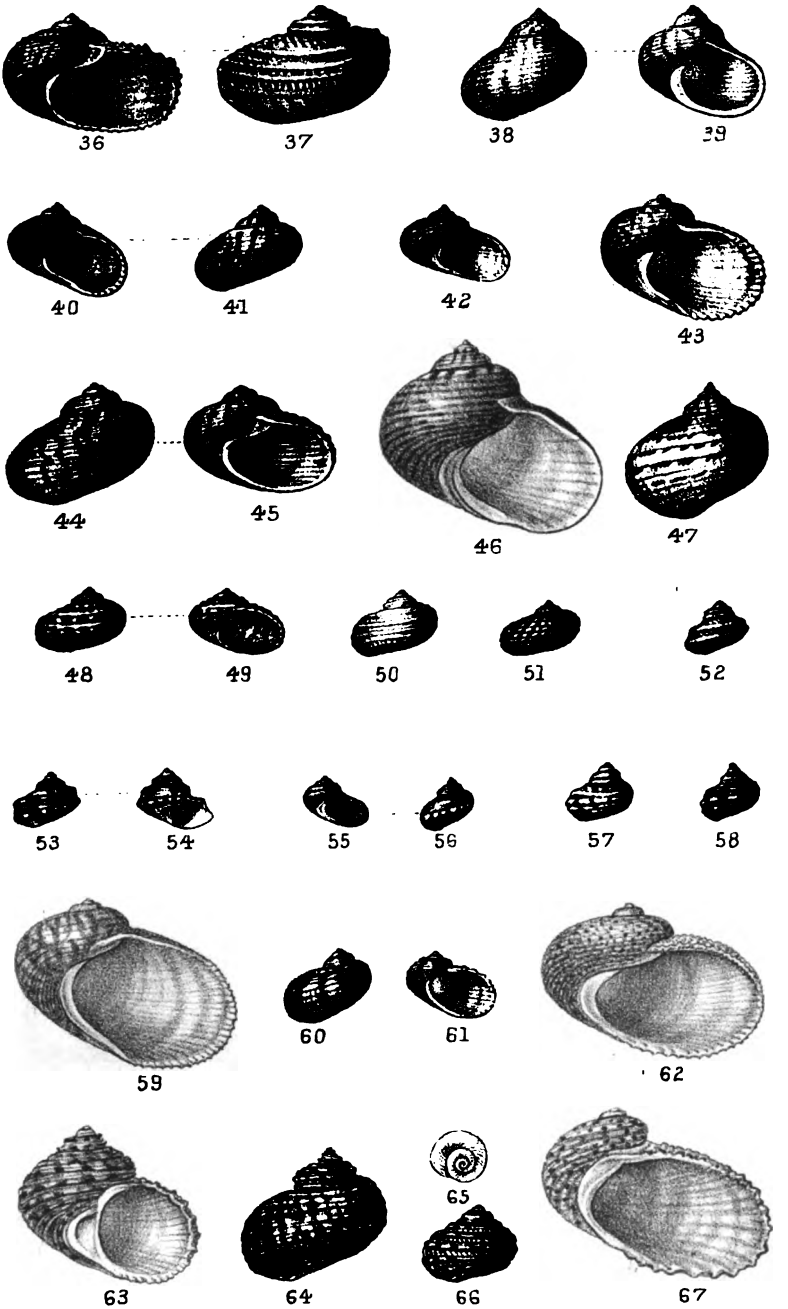

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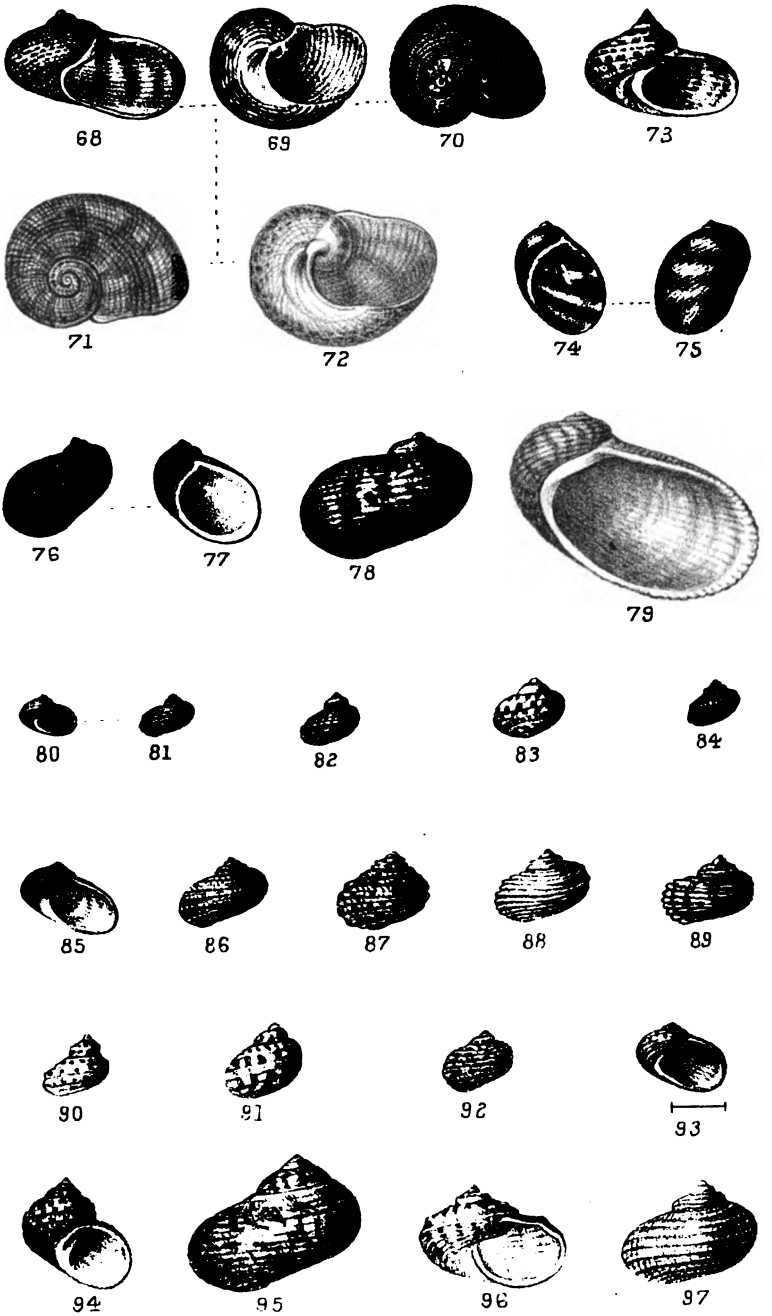

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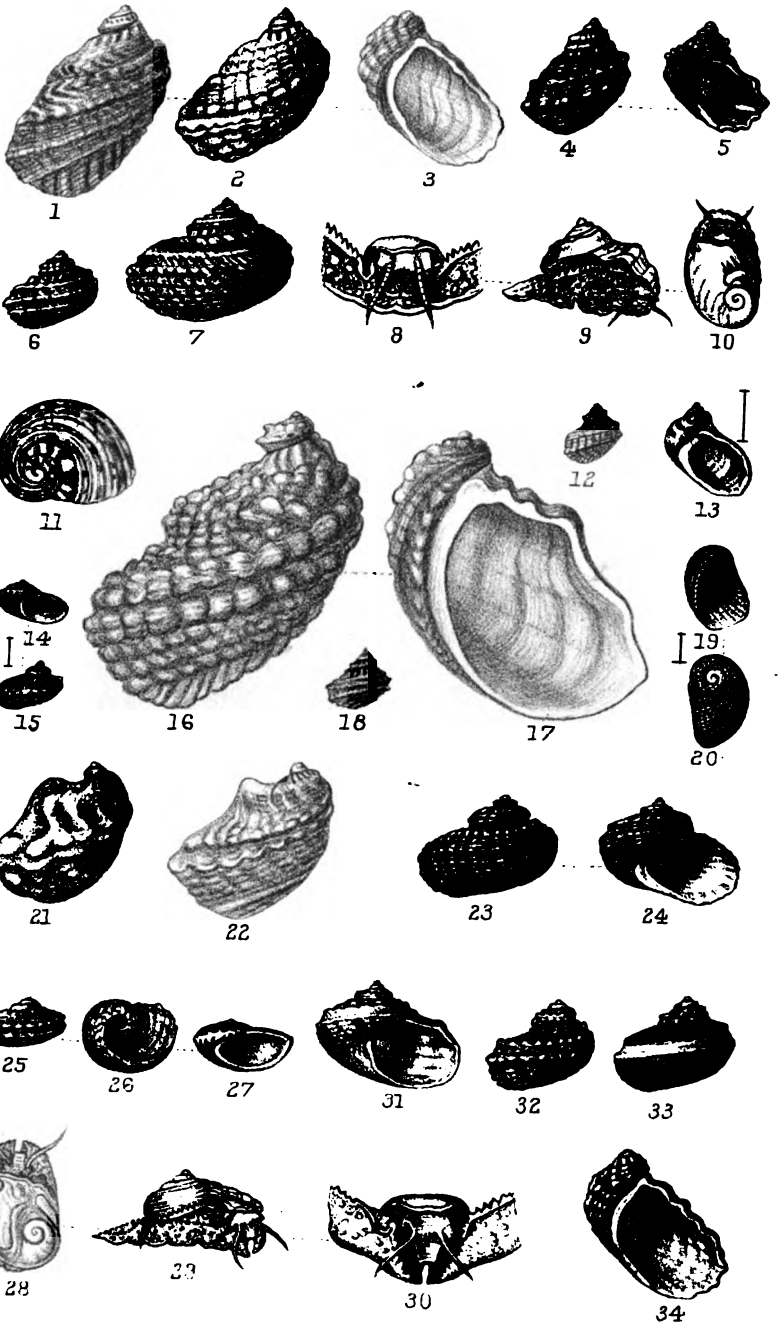

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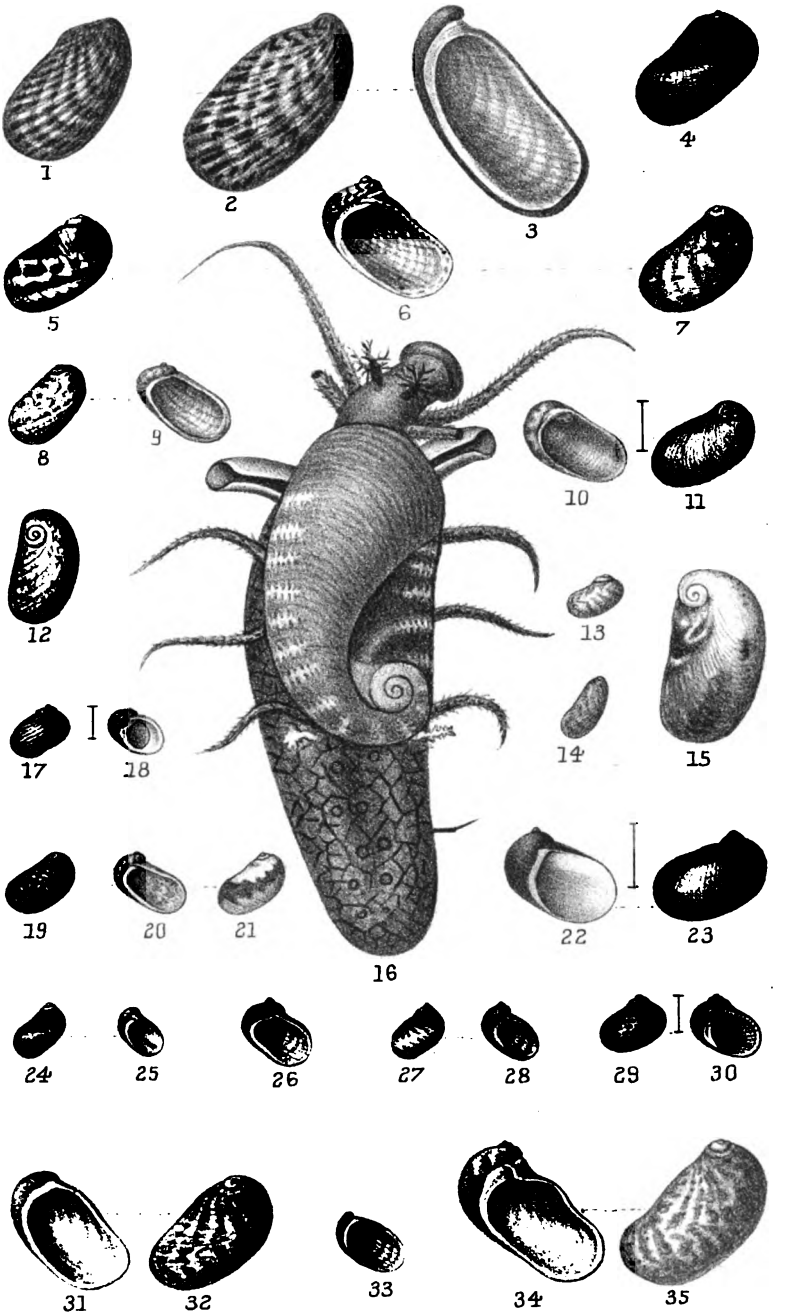

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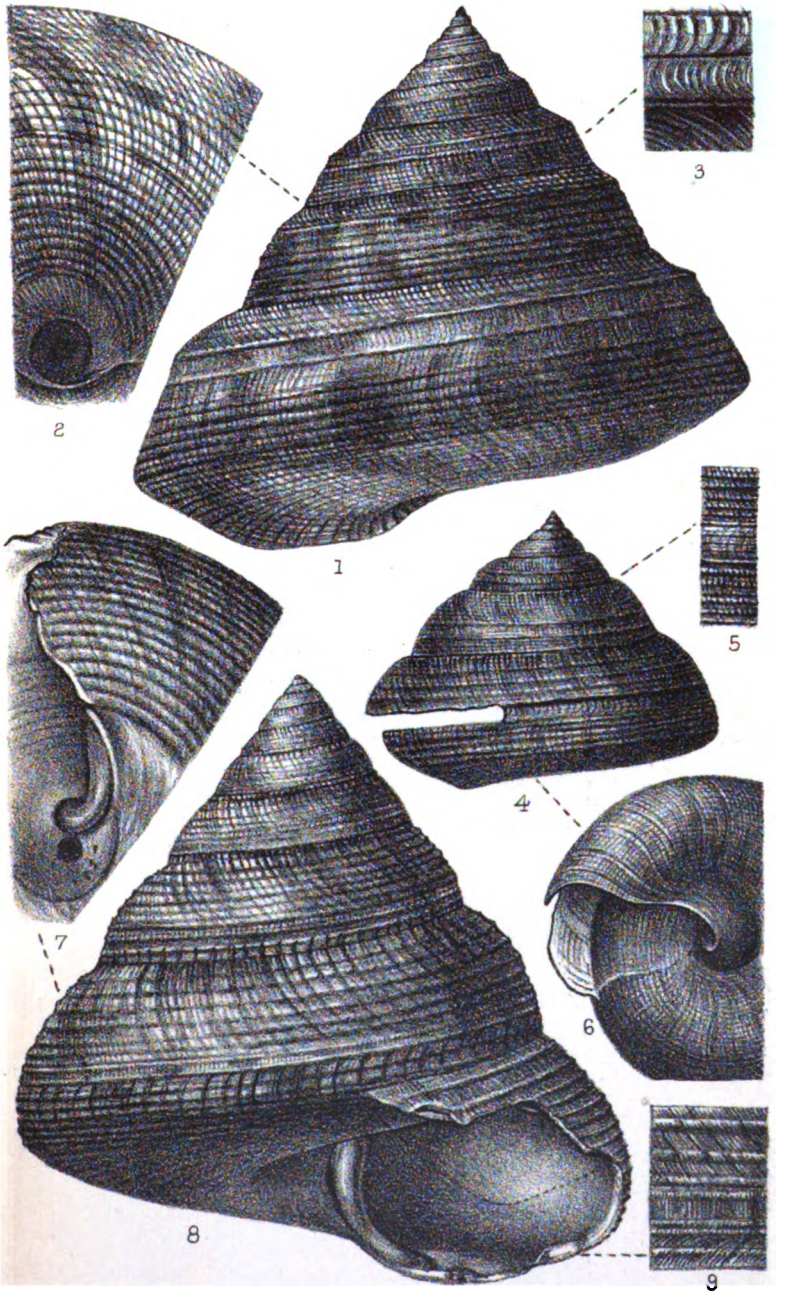

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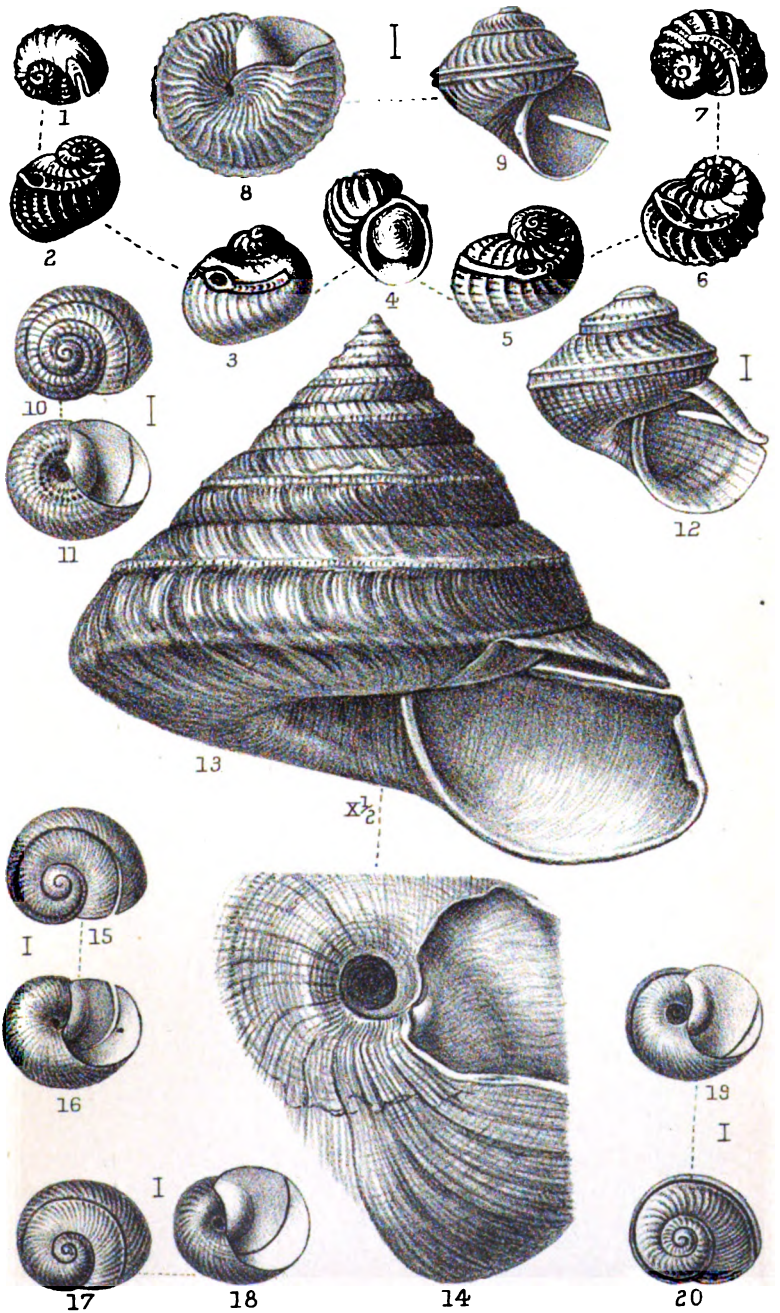

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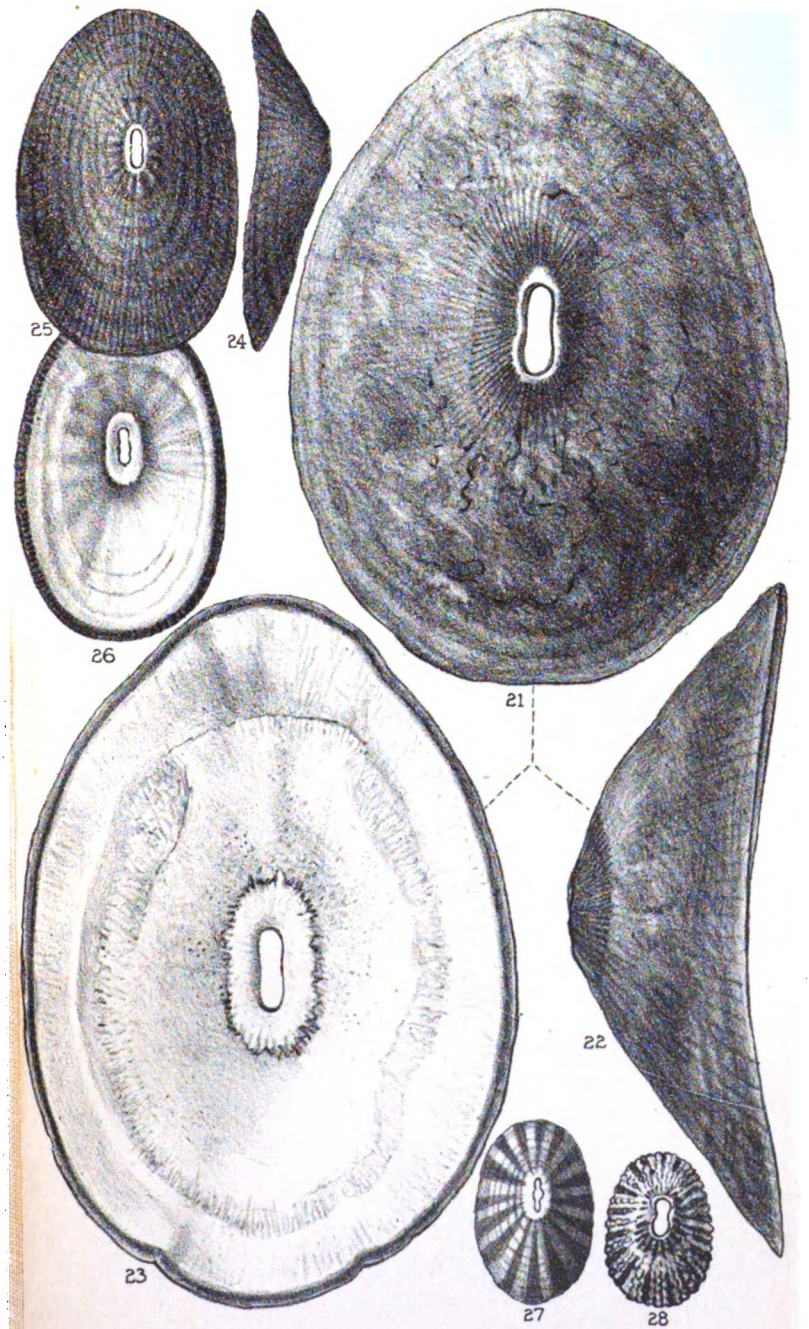

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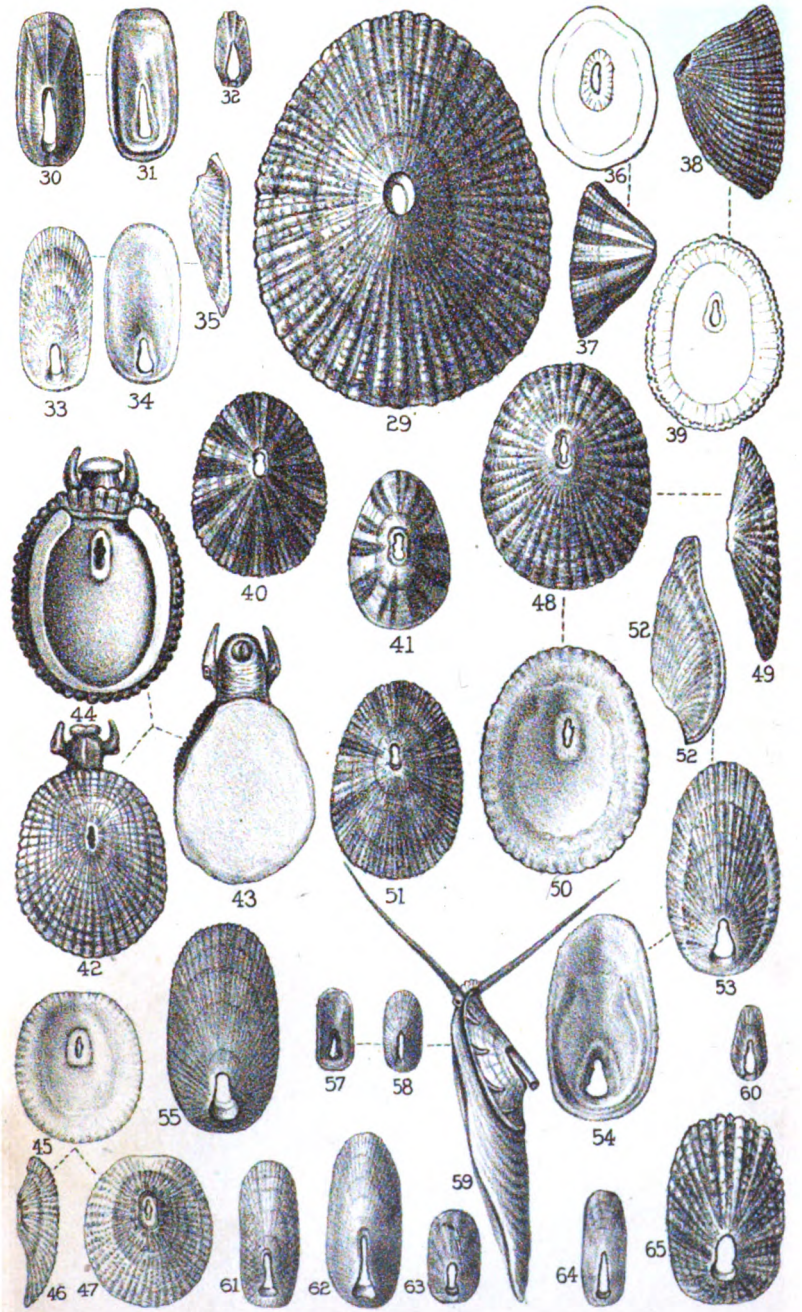

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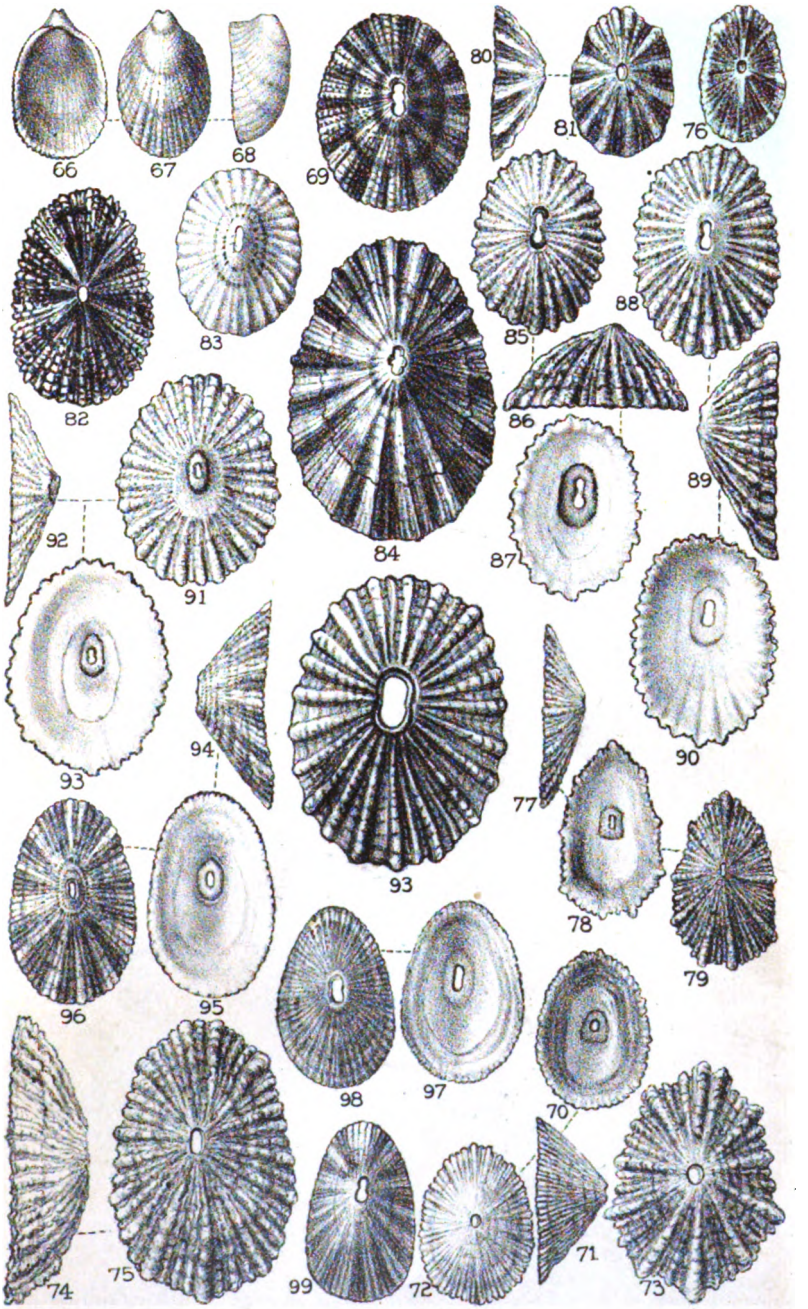

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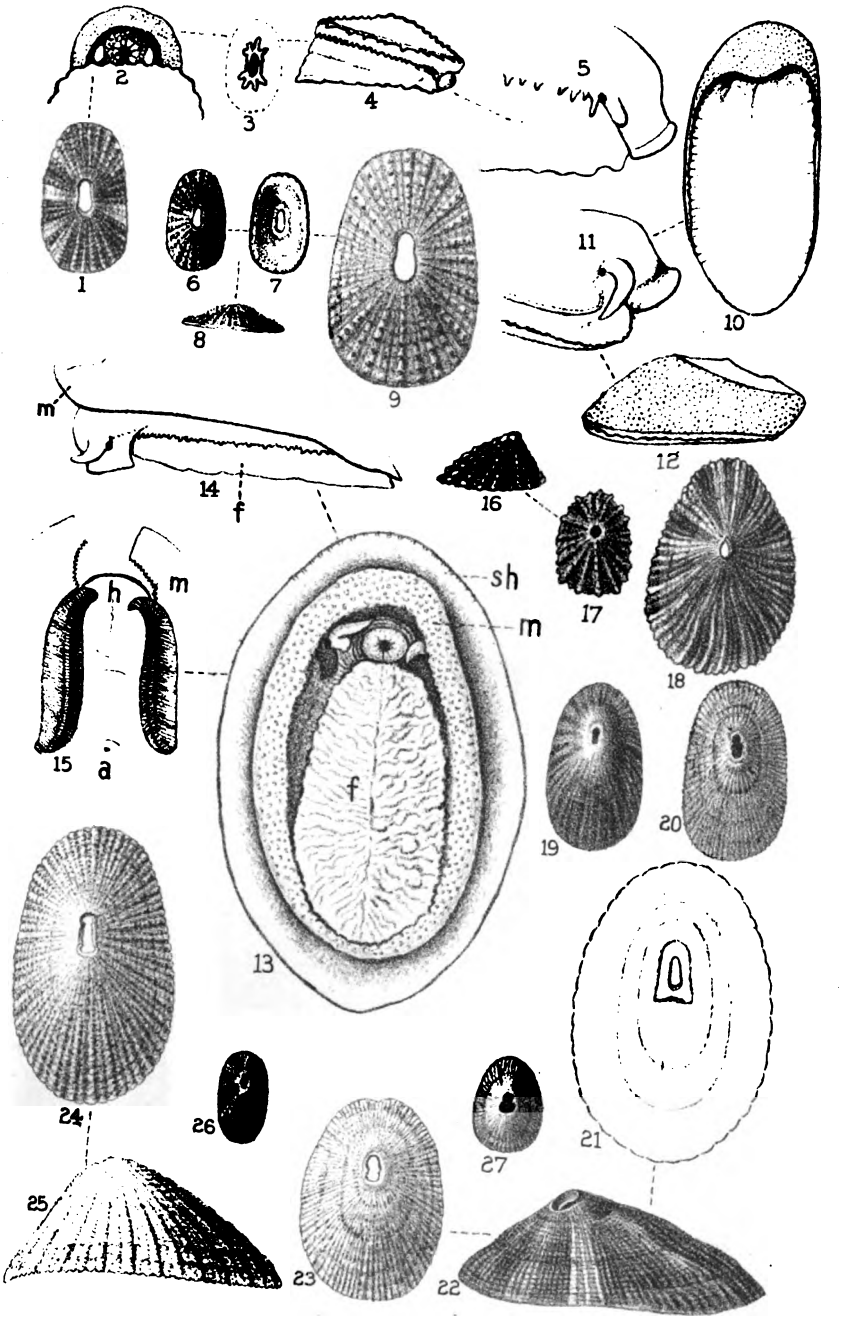

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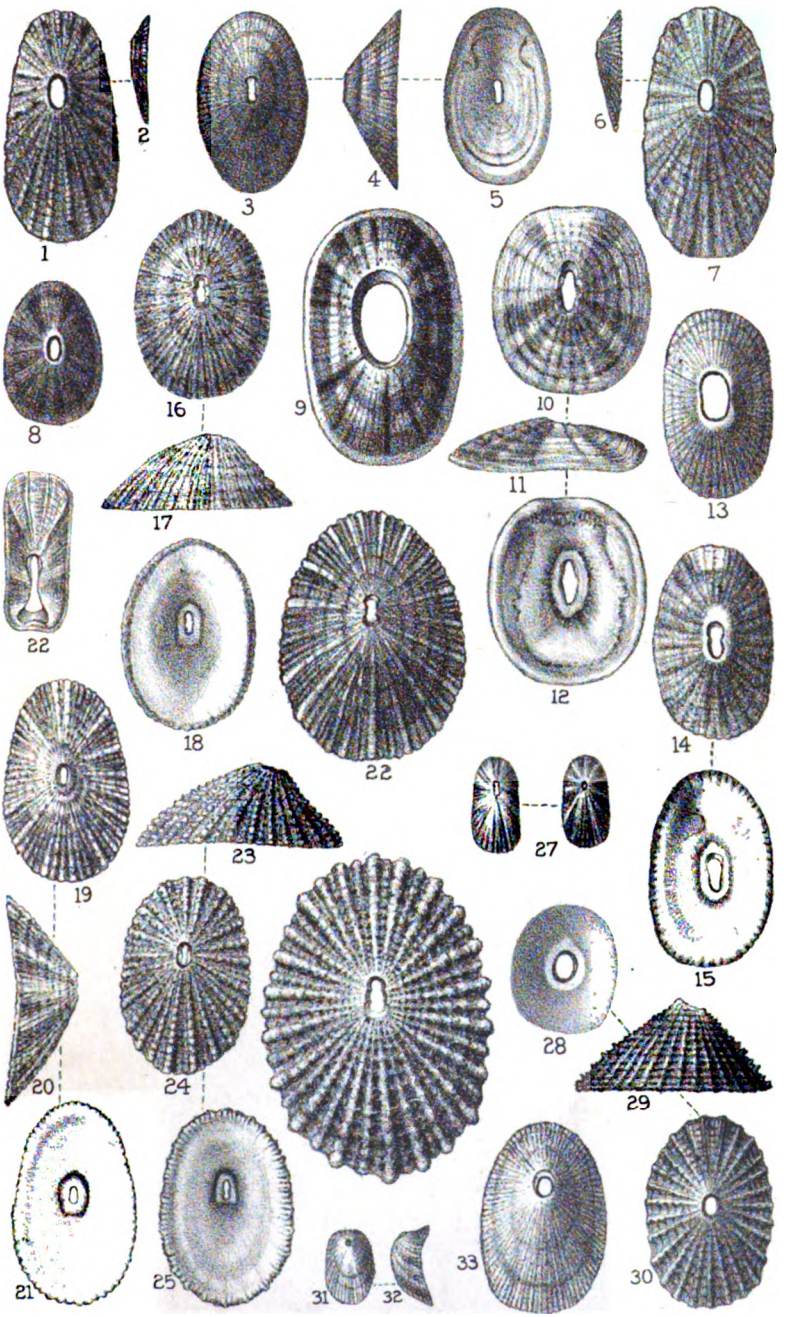

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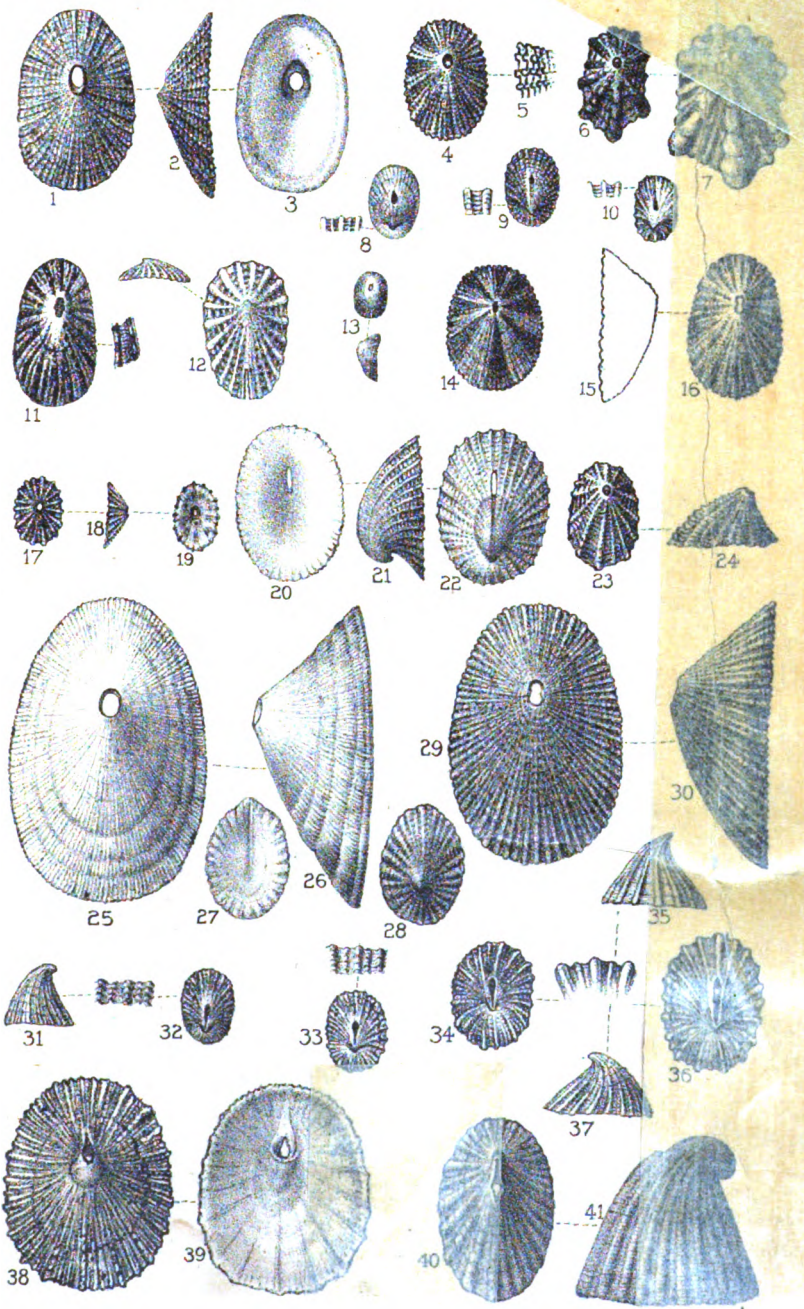

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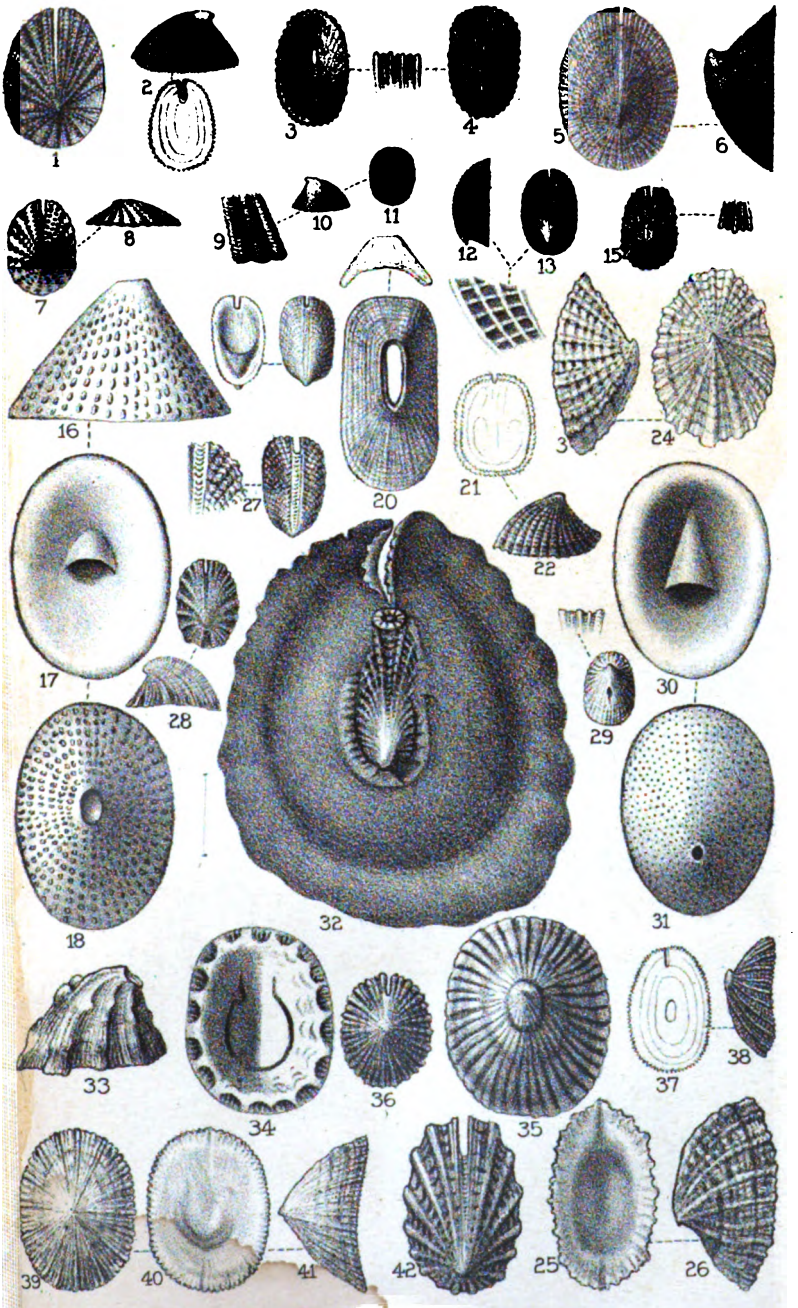

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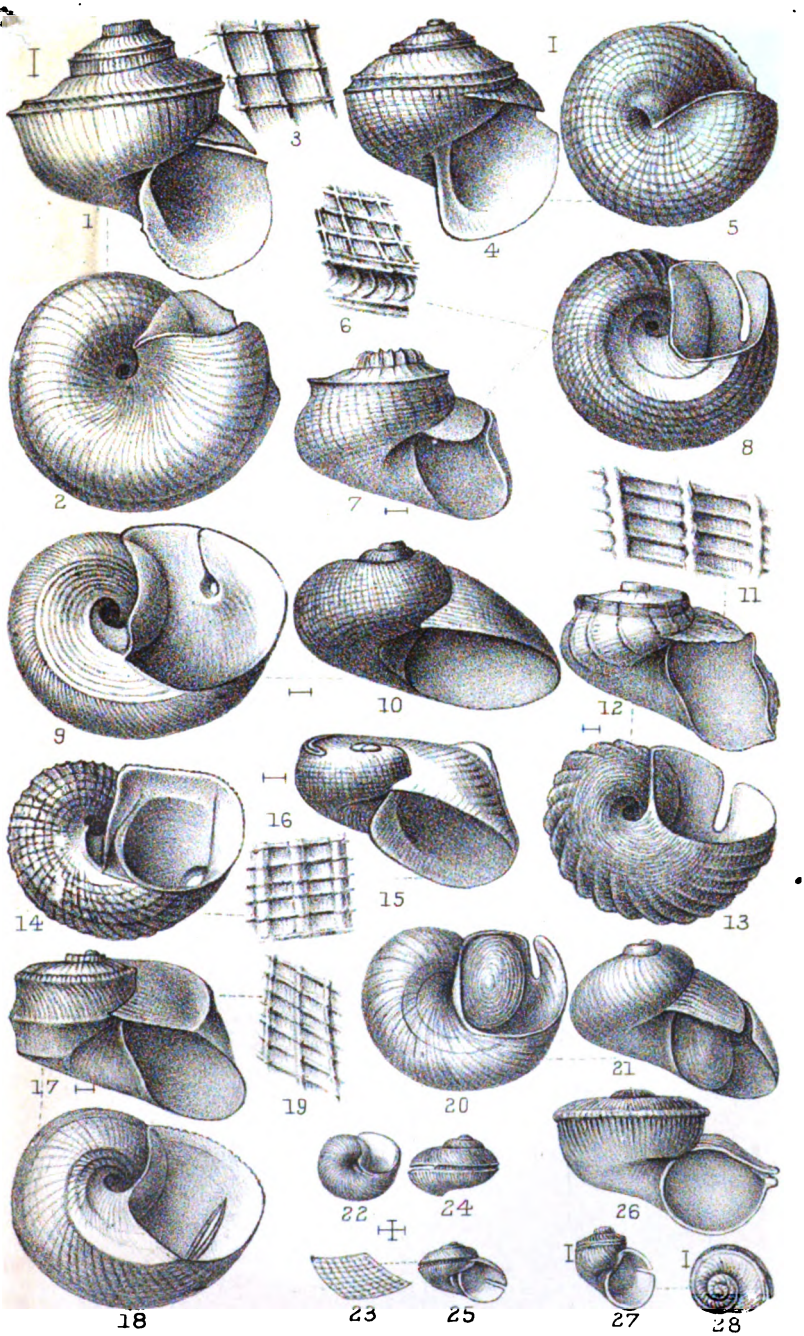

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